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ABSTRACTS FROM THE LITERATURE RELATING TO CONDITIONS IN THE TRACHEA AND BRONCHI.

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In the perusal of the literature for late 1938 and early 1939 dealing with the history, anatomy, physiology, pathology, diagnosis and treatment, including surgical technique of the trachea and bronchi, the wealth of material was such that only some of the articles could be included in this abstract.

Considerable pains and efforts have been taken by Myerson¹ to give a very comprehensive paper on the history and development of bronchoesophagology. The illustrations are very illuminating and show the strides that have been made within this century of progress.

Jackson² discussed and reasoned that the name of the American Bronchoscopic Society should be changed. "In suggesting for consideration the changing of the name of this Society, it should be emphasized that it is not a matter of terminologic hair-splitting, nor is it a matter of semantics; but rather of: *a.* the establishment of a new department of study; *b.* doing justice to our work; *c.* conforming to the act of all other special medical societies in adopting a name indicating the field of work, or department of study, rather than the method of the instrument of examination. There is another reason, and I think it is an important one. The name of our Society entirely ignores one of the important fields of our work; namely, the esophagus. Finally, if this Society should decide that Bronchoscopic is a *nomen conservandum*, I should venture to predict that at some future time the membership as then constituted will reverse the decision; moreover, I should

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still believe that there are departments of study worthy of the names bronchology and esophagology."

Neil, Gilmour and Gwynne³ feel that the thoracic surgeon and the clinician need a means of precise localization of pulmonary lesions. Ewart, whom these authors quote, has shown that "within each lung large groups of lobules are kept in practical isolation from each other as regards to their air supply. Each of these sublobar groups may be considered as forming separate respiratory districts." They propose a system of nomenclature of the bronchi that seems to be very practicable.

Normal anatomic studies of dissection models and bronchoscopy, including histology of the bronchi by dePablo⁴ give many details usually not noted. To be appreciated, this work must be inspected.

An apparatus for the automatic registration of the movement of the bronchi presented by Boriano⁵ is of great interest. While highly technical, those interested in the physiology of the bronchi will be repaid by personal study of this work.

Pathologic aspects of bronchiogenic carcinoma, written by Halpert,⁶ was part of a symposium on carcinoma of the lung.

An unsuccessful manubriotomy was done on a child by Calbert and Grimmond⁷ for the removal of two foreign bodies in the bronchus.

Laskiewicz⁸ reports five cases of foreign bodies in infants under 16 months. Tracheotomy was done on two infants. One died.

Gill⁹ discusses the management of foreign bodies in the trachea and bronchi, reporting 36 cases, with one death. He stresses the necessity of obtaining a careful history in children with unexplained cough, X-ray study and bronchoscopy.

Mornier-Kuhn¹⁰ reported a case of syphilitic granuloma of the bronchus. Few cases such as this one are found in the literature.

In 182 cases, Lindgren¹¹ enumerates the following groups of tumors, *viz.*: Adenomas, 133; mucous polypus, 17; fibromas, 12; chondromas, nine; lipomas, five; Papillomas, three; lymphoma, one; colloid goitre, one; mixed tumor, one.

Diagnosis by pneumonograms and bronchoscopy is stressed; also, therapy is discussed.

At a clinical conference¹² held in Willard Parker Hospital, New York, Jan. 10, 1939, Dr. Werlin reported the case of an 8 months old child admitted from Bellevue Hospital. It was a case of staphylococcus aureus laryngitis. Illness began with cough five days before admission. Cough became increasingly severe and breathing became somewhat labored. Temperature, 104°. Examination showed moderate stridor, within a few hours became cyanotic and had extremely labored breath sounds. Was given oxygen in the ambulance while being transferred from Bellevue Hospital. On admission, patient was acutely ill, cyanotic, respirations were very rapid and shallow. Pulse, 178; respirations, 64; temperature, 104°. Laryngoscopy revealed thick, tenacious mucus in the larynx. This was removed by suction. There was a generalized inflammation of the tissue of the introitus of the larynx. Patient was intubated with considerable relief; later, tracheotomy was done, temperature going to 107°. Patient expired within a few hours. Staphylococcus aureus was cultured from larynx. Autopsy: epiglottis and arytenoids were slightly edematous; however, there was a clear airway above and immediately below the cords. There were patches of atelectasis at right apex. Thymus was large. Heart normal, Liver slightly yellowish. The lungs showed pneumonia, and some of the bronchi on microscopical examination were found to be surrounded by lymphocytes.

In the discussion, it was shown that 20 per cent of obstructive laryngitis showed staphylococcus aureus in pure culture.

At the same conference noted above,¹³ a report was made of a 6 months old child, with acute laryngotracheobronchitis with bilateral pneumothorax, was admitted but died within six hours in spite of all treatment. Autopsy showed that there was pneumothorax on both sides, collapse being total, the right lung being one-half its normal volume, and the left, one-third.

Conclusions reached by Evans¹⁴ that an early diagnosis is essential and that all cases should be hospitalized and a direct laryngoscopy and bronchoscopy be carried out. Tracheotomy should be done if indicated. Proper and intelligent nursing,

forcing fluids, and properly repeated aspirations of the trachea and bronchi. Bacteriophage is used in staphylococcus infection.

Foster¹⁵ considers that stenosis of the larynx is usually amenable to appropriate treatment. Dilatation with Jackson core molds is advocated, particularly in young children. In older children and adults, where the cricoid has been severed, laryngofissure, skin graft and replacement of cricoid is the method of procedure.

A postulate by Clerf¹⁶ that every case of bronchial obstruction should be considered as a potential case of bronchiectasis is of considerable interest. Bronchoscopic investigation is indicated — delay promotes retention and stagnation of secretion, infection of the bronchial wall and, ultimately, development of bronchiectasis.

In the treatment of bronchiectasis, Cole and Nalls¹⁷ advocate various therapeutic measures in the treatment of bronchiectasis. Lobectomy and pneumonectomy are advised in selected cases. Lipiodol, postural drainage and bronchoscopy are discussed and evaluated. Climatic treatment does not seem to have any merit according to these authors.

Congenital tracheoesophageal fistula is an exceedingly rare condition — few cases being found in the literature. Imperatori¹⁸ discusses the embryology and reports a case of a child of 6 years in whom he closed the fistula by plastic operation. In this particular patient there was no atresia of the esophagus but there were symptoms of cardiospasm. Since closure of the fistula, over one and one-half years ago, the child has gained eight pounds in weight.

Canuyt and LaCroix¹⁹ report on a bronchoesophageal fistula, detailing the autopsy findings; and Piquet, Miller and Marchant²⁰ describe a bronchoesophageal fistula following an injury.

Vinson and Jones²¹ report on a case of nonfatal rupture of the bronchus.

The results of stellectomy in bronchial asthma are interestingly reported by Leriche and Fontaine.²² Stellectomy was performed in 14 cases of bronchial asthma. Unilateral stellectomy performed on seven patients resulted in five failures and

in the disappearance of the asthma in two cases. One of the latter has remained well for 13 years, the other still has mild paroxysms of asthma. Immediate disappearance of the asthma following bilateral stellectomy was noted in four cases. Definite improvement followed the bilateral operation in three other cases. Preliminary infiltration of the stellate ganglion, prior to stellectomy, was of value in attenuating or arresting the asthma. While preparing for the operation, the surgical procedure was well tolerated by the patients. Abstracted from *Allergy Abstracts*, Vol. 4, No. 2, 1939, by H.

Van Dishoeck²³ summarizes his observations on the course of inspired air in the upper and lower respiratory tract as follows: Where there is free air entry on both sides of the nose, the inspiratory currents are mixed up at a level of the tongue. In the case of a unilateral stenosis of the nose, the inspiratory air current of the stenosed side remains on that side and passes through the glottis on the same side. A much higher percentage of air enters the lung on the same side than the lung of the other side. Aspiration of drops of mucus into the lung of the same side, or in other cases in both lungs, is of little or no importance to the pathogenesis of bronchitis in sinusitis cases. As was shown in model experiments, drops of pus are only transported over little distances by very fast air currents (snuffing). The mucus is hardly transported at all. The inflow of pus during sleep into the pulmonary system in cases of sinusitis is a more important factor in the etiology of lung infections.

A description by Chang²⁴ of two infants, one with an allergy of the larynx, and the other of the tracheobronchial tree, is most unusual, for the allergen was milk. Both patients, one age 3 weeks and the other age 15 months, required tracheotomy. Both patients recovered.

Diagnostic X-ray for tracheoesophageal fistula is presented by Goldberg,²⁵ and also sequestration of anthracotic and ossified bifurcation lymph nodes with bronchial and esophageal fistula by Gagelman.²⁶

A very unusual condition is noted by Wohman.²⁷ There are but seven cases recorded. The symptoms were stridor, peculiar grunting noise, paroxysms of coughing, associated with dyspnea, occurred during feeding — this being the distinct and

particular symptoms of a 4½ months old infant. Diagnosis was that of congenital laryngeal stridor and bronchopneumonia.

Necropsy: Bilateral bronchopneumonia. Larynx negative. Double aortic arch constricting the trachea and esophagus.

Kearney²⁸ reviews recent literature on bronchiogenic carcinoma, and Toggino²⁹ evaluates bronchoscopic methods in malignant disease of the bronchi.

Routine bronchoscopy is not a contraindication in patients with active tuberculosis. Formerly this was considered a hazardous procedure. Today it is not. McTudors and others³⁰ advocate this method of diagnosis, for it was found to have no deleterious effect upon any of the 272 patients with active pulmonary tuberculosis examined. Eleven per cent of these patients were found to have tuberculous lesions of the trachea and bronchi. The conclusions reached by Butler,³¹ Lincoln, Deegan and Horton are that there is still need for education of the profession and the laity regarding the dangers due to aspirated foreign bodies. Without bronchial obstruction, a foreign body may be tolerated, but with obstruction the reverse is the rule, and the results are acute suppurative pneumonitis, and later chronic bronchiectasis.

A description of a bronchologic clinic is detailed by LeMee and Soulas,³² modeled on those of America, particularly the Jackson Clinic at Temple, in Philadelphia.

Injection of lipiodol for diagnostic purposes in the tracheo-bronchial tree in infants and adults is dealt with in detail by Soulas.³³ The various methods are given and a very complete bibliography is appended.

Arbuckle and Stutsman³⁴ are of the opinion that because of improved diagnostic and therapeutic methods, the outlook for persons suffering from a rather wide variety of pulmonary disorders has improved tremendously during the past decade. Of importance in the application of these methods of study and treatment is the realization that this is a special field, in which, in order to obtain the best results, the work must be carried out by a group, each member of which has been thoroughly trained for his particular job. In our service, some of the members of this group find it necessary to have their own

individual teams in order to carry on more satisfactorily with their phase of the work.

The epoch-making developments in thoracic surgery of the past five or 10 years have depended not only on improved surgical technique, anesthesia and postoperative as well as preoperative care, all of which are of first importance, but also on better X-ray and pathologic studies. Probably the greatest single step forward has been early and actual diagnosis by direct inspection of the lesion.

The presence of pulmonary disorder of almost any type may be demonstrated by the usual methods of study; namely, physical and X-ray; but, unfortunately, such studies do not reveal in many cases the exact nature of the disease, nor do they demonstrate its endobronchial distribution. These usually may be established by direct endobronchial inspection and by the study of specimens obtained during the course of this inspection.

The same approach is extremely valuable in the treatment of certain varieties of pulmonary disorder, prominent among which are lung abscess and localized tuberculous lesions. The percentage of cures obtained by bronchoscopic treatment in cases of lung abscess demonstrates the necessity for keeping in mind this method when outlining treatment in such cases. It is, of course, the accepted method for removal of a foreign body and is the only approach for applying direct treatment to localized tuberculous lesions.

In establishing the cause and location of unexplained pulmonary bleeding, direct inspection (bronchoscopic) has been found most helpful. We have had no unfavorable reaction as a result of the necessary manipulations, and it is our feeling that the propitious time for such examination is while bleeding is active.

Rienhoff³⁵ advises a two-stage operation for total pneumonectomy in treatment of carcinoma of the lung. A new technique for the closure of the bronchus is given.

Vinson³⁶ observes that tuberculous lesions of the trachea are frequently more extensive than those of carcinomatous origin. Bronchial occlusion is strongly suggestive of carcinoma. Biopsy should be done. Treatment of patients with

obstructing tuberculous lesions of the tracheobronchial tree is unsatisfactory. Collapse of the lung and dilatation of the stricture should be combined to produce satisfactory results.

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SYMPOSIUM ON PERORAL ENDOSCOPY.

(a)—THE INCEPTION AND DEVELOPMENT OF PERORAL ENDOSCOPY.*

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This presentation is limited to the efforts of the early pioneers in peroral endoscopy. The sword swallower, on the one hand, and the laryngeal mirror and intubation of the larynx on the other, served as the forerunners of endoscopy. The various methods of illumination, from the candlelight of Bozini, in 1795, to the present-day Bruning electroscope and Jackson light carrier, are reviewed.

The early, crude esophagoscopes of Stoerk, Bevan, Kussmaul, Waldenburg and others are discussed, and their influence upon the first rigid tube of Stoerk is emphasized. The work of von Hacker, Rosenheim, Gottstein, in addition to Kirstein and Killian, paved the way for present day endoscopy. In this country, first Einhorn and later Jackson and Mosher devised esophagoscopes. Gastroscopy and its development are discussed in a few paragraphs.

Imperator has recently been experimenting with visualization, not only of the pylorus but of the duodenum. He calls his procedure "peroral duodenoscopy." The instrument consists of a telescope enclosed in a sheath. It is 64 cm. long and has a special lens system. The instrument is guided over a thread and is introduced as for esophagoscopy.

Kirstein was the first to pass a rigid tube into the larynx and trachea. This he did in April, 1895. Shortly after this, Killian deliberately passed a 9 mm. tube into the bronchus of a male adult. He was the first to remove a foreign body from the bronchus. This he did in March, 1897. Simultaneously with the work of Kirstein, Shroetter and Pieniazek practiced what they called inferior bronchoscopy. This consisted of the passage of a tube through the tracheotomy opening. In 1903, von Ecken for the first time used a laryngeal speculum, through which he guided his bronchoscope. Then Killian, and

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later Jackson and Mosher, introduced special laryngeal specula for this purpose. Laryngoscopes were also devised by Ingals, Yankauer, Arrowsmith, Lynah and others. Suspension laryngoscopy was introduced by Killian in 1909. Lynch modified Killian's apparatus and became the most active worker in this field. In recent years self-retaining laryngoscopes, or directoscopes, have been devised by Seiffert, Haslinger and Atkinson.

In this country, the first successful bronchoscopy was performed by Coolidge, at the Massachusetts General Hospital, in May, 1898. Ingals removed two foreign bodies in 1904. In the following year, Jackson and Yankauer reported the successful removal of foreign bodies. Jackson reported on nine cases.

Jackson has made a steady succession of brilliant contributions since the early days of bronchoscopy. He has spread a knowledge of the science of bronchoesophagoscopy throughout the world, and the present high state of its perfection constitutes a monument to his skill, energy and teaching ability. Through his efforts, America has become the foremost bronchoscopic centre.

The pioneer work of Mosher, particularly in the field of esophagoscopy, must be given special mention. Since his first paper, in 1908, he has made many brilliant contributions to this field, and has stamped himself as a foremost authority.

In the field of medical bronchoscopy, the work of the Mayo Clinic endoscopists under Plummer, Vincent and Moersch, and that of Jackson, Tucker and Clerf in Philadelphia is outstanding. Yankauer, Lynah and Imperatori were also pioneers in this field.

It is impossible to give due credit to many workers, especially our contemporaries in this country and abroad who have contributed much to the development of peroral endoscopy. The roster of the American Bronchoscopic Society, since its inception in 1917, contains the names of many whose work has proven that "seeing is knowing."

136 East 64th Street.

SYMPOSIUM ON PERORAL ENDOSCOPY.

(b)—ANESTHESIA.*

DR. ROBERT L. MOORHEAD, Brooklyn.

In consideration of the subject of anesthesia for peroral endoscopy, we are confronted by a situation entirely different from that which is encountered by the general surgeon. A properly performed endoscopy causes no pain whatever in any part of the procedure — thus, the subject of pain is eliminated from the discussion. The anesthetic is used solely to eliminate the various reflexes which either cause discomfort to the patient or interfere with exact manipulations by the operator. In work upon the respiratory tract, the elimination of the cough reflex is the sole purpose of the anesthetic and in a like manner, in esophageal work, the elimination of the gagging and choking. One might dispute this statement with the assertion that the patient's feelings are to be considered, but if the reflexes are abolished, the patient suffers no discomfort. It is these reflexes that disturb the patient and if we can overcome or abolish them, the procedure is rarely objectionable from the patient's standpoint. When this subject was assigned to me by your President, I wrote to a dozen endoscopists concerning their routine procedures, and the results are somewhat surprising. No two agree as to the preparations to be used and the method of their use.

General Anesthesia (ether, etc.): Practically all agree that general anesthesia should be employed where complete relaxation is desired (as in the removal of very large impacted or very sharp foreign bodies). Those of us working in the large centres are accustomed to complete facilities and team work. The latter is absolutely essential, but in the smaller hospitals, with their frequent staff changes, this team work may not be available, and under such circumstances the use of a general anesthetic may overcome many difficulties. I believe that with efficient co-operation and team work general anesthesia is necessary in only a small percentage of our cases. There are some patients — fortunately few — who not only will not

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co-operate but who will actively oppose all attempts at examination or treatment. Such patients should have the benefit of general anesthesia, for any attempt to work upon such a struggling patient may cause serious injury. Only one of my correspondents advocated the use of general anesthesia as a more or less routine measure.

Preliminary Medication: Practically all operators agree that preliminary medication is essential. Morphine gr. $\frac{1}{4}$ by hypo with atropine gr. 1/150 seems to be the majority choice, but many operators use other combinations. Scopolamine gr. 1/300 to 1/100. Sodium amytal gr. 3, nembutol gr. $1\frac{1}{2}$, euphagin 1 tablet, paraldehyde, hyoscine gr. 1/300, seconal gr. $1\frac{1}{2}$, all have their advocates, with the medication given at various times before the morphine. Several of the writers give gr. $\frac{2}{3}$ or $\frac{1}{3}$ of morphine in divided doses. In children, most men now give some morphine as a preliminary medication, the dosage being estimated by Young's rule. Practically all agree that the time element in connection with preliminary medication is an important element. It should be given far enough ahead of the operative procedure that the maximum effect may be obtained.

The writer believes that a large dose of morphine is the most important factor in the whole anesthetic problem. We do not hesitate to give morphine gr. $\frac{1}{2}$ to a strong, robust individual and, with this as a standard, reduce it accordingly with pale, weak or emaciated patients. The larger doses of morphine reduce greatly the quantity of whatever medication is to be used locally.

Local Medication: Here opinions seem to vary widely, both as to the solutions employed and in the method of their application. Considering the latter, many anesthetize the pharynx and larynx by spraying, while others accomplish their results by instillations or the direct applications of the solution on sponges. There is the greatest variation in the solutions used, although close to half of my correspondents use 10 per cent cocaine by some method — the remainder are divided as to larocaine, pontocaine, and Forester's solution (weak cocaine). One observer writes that "pontocaine has occasionally seemed toxic but the larocaine has never produced the slightest sign of toxicity; however, the pontocaine is not quite so effective as cocaine, and the larocaine is definitely less effective." The

writer has seen no reason to change from a routine adopted years ago of using stronger solutions in less quantity. After a large dose of morphine ($\frac{1}{4}$ to $\frac{1}{2}$ gr., depending upon the individual), the laryngeal surface of the epiglottis is lightly painted with a 20 per cent cocaine applied on a bronchoscope sponge. All excess solution is squeezed out of the sponge before use, as we believe the real danger is from the excess which may be pressed off, swallowed and absorbed. Exposing the cords, a like application is made down the trachea. Frequently one application through the cords is all that is necessary, and never more than two. We consider this much safer than spraying with a 10 per cent solution, for, although the patient may be instructed not to swallow, many of them will do so almost involuntarily. The amount of solution used with a spray varies, depending upon the spray outlet and the amount of air pressure; however, the spray method seems to be satisfactory in the hands of a number of the good endoscopists. On the other hand, an analysis of the cases showing toxic manifestations from cocaine proves that a large percentage have had the solutions sprayed or instilled. The writer has continued to anesthetize the parts by applying the solution on large size bronchoscopic sponges. If care is used, the amount of solution on a given swab is comparatively small and, even after use, most of the solution is returned to the operator still on the sponge. To us, this method has never given a single case where signs of toxicity have been shown and is relatively comfortable for the patient. Regarding esophagoscopy, the opinions seem to favor the same preliminary medication, with a few making local applications of cocaine by spray or applicators.

In conclusion, one may say that there is no agreement as to the best method to be employed. Apparently the ideal anesthetic for endoscopy has not yet been discovered. Each individual operator is thus left to his own choice in the selection of an efficient, and what seems to him to be a safe method of anesthesia. It would seem that an investigation by this or some similar organization might be undertaken to standardize the procedure, for at present it is certainly very confusing, not only to ourselves but to our students.

125 Remsen Street.

SYMPOSIUM ON PERORAL ENDOSCOPY.

(c)—MANAGEMENT OF BRONCHOSCOPIC CLINIC.*

DR. DAVID H. JONES, New York.

The Bronchoscopic Clinic was started at the Manhattan Eye, Ear and Throat Hospital by Dr. C. J. Imperatori in two rooms, with a staff of four men, one from each clinic; now we have an ideal unit of five rooms, with 10 men on the staff.

In order to keep accurate records we must have a uniform system. The system we have has proven satisfactory but, of course, we have the same difficulty as is found elsewhere; namely, keeping up the records.

The next problem is to acquire the special instrumentarium which is necessary to perform this work and, as you know, it consists of tubular specula of various sizes and shapes. The tubes are of tempered brass, rigid and straight. Many different types of handles are used, serving for ease in introducing and for attaching light carriers.

Two forms of lighting are used: proximal, in the instruments of Kirstein and Guisez type, the head light on the operator's forehead giving the illumination, while in the Bruning and Kahler instruments the light is in the handle. The other form of lighting is the distal type (Jackson), which the majority of bronchoscopists use and where the light is protected in a recess at the end of the light carrier canal. This permits a forceps and other instruments to be introduced without obliterating the light. Dry-cell batteries give the best form of illumination.

No single instrument can be used in all cases; therefore, it is necessary to have all sizes of laryngoscopes, bronchoscopes and esophagoscopes, with all necessary equipment of forceps, dilators, aspirators, swab carriers, etc.

Every bronchoscopic operating room should have both positive and negative suction pressure, preferably one where the pump is at some distance, which will obviate any dan-

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ger of explosion from ether anesthesia. This room should be equipped solely for bronchoscopy and should be near the biplane fluoroscopy room. It is essential that a set of instruments be kept sterile, all equipment being ready for an emergency. Provision should be made to darken the room and for a good overhead light for use in tracheotomy. It is necessary to have a specially trained nurse to assist at the operation and to care for the instruments. Instruments are sterilized by boiling, except light carriers, lamps and cords, which are sterilized with 95 per cent alcohol.

I feel that the laryngologist, being familiar with the air and food passages, is the one best qualified to take up this speciality. The beginner in bronchoscopy, and I wish to stress this, that not everyone is fitted to do bronchoscopic work (my associate, Dr. John M. Loré, is of the same opinion); he should be able physically and temperamentally to do this work. His first task is to familiarize himself with the laryngeal picture, using a laryngeal mirror, calling out the different areas with a system; namely, epiglottis, aryepiglottic folds, arytenoids, vestibule, ventricular bands, ventricles, if seen, true cords, also movement of cords, subglottic area, anterior and posterior commissure, and pyriform fossa.

One wall of the examining room is fitted with charts showing the normal larynx and the different forms of paralyses. After he has acquired the technique of indirect laryngeal examination, he should train his eye at the rubber-tube manikin board, where it is necessary to practice monocular control, to recognize objects and to gauge distances, also to observe the light reflex which occurs when the forceps blades pass the distal light. This means that the blades are at the end of the tube. The rubber-tube manikin enables him to acquire the feel of the tubes and the general technique, as all problems of foreign body extraction can be simulated. Further practice can be obtained on the cadaver and narcotized dog before any operations are performed on the living patient.

Bronchoscopy is not a one-man job but calls for team work, each member being thoroughly drilled in his particular duty, making it almost automatic. The team consists of the operator and the first assistant, who holds the head so that the rigid tube can be introduced and passed without any more discomfort than necessary. At Manhattan, we use the Hass-

linger head rest with all patients except children with entire satisfaction. The second assistant is the bronchoscopic nurse, who has charge of the instruments, while the third assistant holds the shoulders down on the table.

We have eight ear, nose and throat clinics, and one assistant surgeon is assigned to the Bronchoscopic Clinic for a year. Through this surgeon, all patients with a history of hoarseness, dyspnea, inhaling a foreign body, dysphagia and swallowing foreign bodies are referred to this clinic. It is his duty, at the time of the first visit, to obtain a history, drawing of lesion, if any, X-ray of neck and chest, serological and complete physical examination before any operation is done.

This clinic functions on Tuesday and Friday afternoons, and if tests on the patient's second visit are negative he is told when to return for operation.

It is the duty of every surgeon who removes a specimen of tissue to consult with the pathologist as to the location of the lesion, as I believe a great responsibility is placed upon him.

I wish to express my gratitude to the surgeons who have written to me regarding their methods of conducting their respective clinics.

Kipling's verse applies very well to this team:

"It ain't the individual
Nor the army as a whole
But the everlasting team work
Of every blooming soul."

Lantern slides were shown illustrating the instruments, the rooms of the clinic and the history cards.

Personal communications from Dr. Clerf, Dr. Arbuckle, Dr. Vincent, Dr. Zinn, Dr. Orton, Dr. Beck, Dr. Lukens, Dr. Kiernan, Dr. Jackson and Dr. Tucker.

140 East 54th Street.

SYMPOSIUM ON PERORAL ENDOSCOPY.

(d-1)—INDICATIONS FOR DIRECT LARYNGOSCOPY AND BRONCHOSCOPY.*

DR. RUDOLPH KRAMER, New York.

Direct laryngoscopy, which includes suspension laryngoscopy, is indicated for diagnosis in patients with symptoms of laryngeal disease, such as hoarseness or other voice changes, dyspnea, stridor, irritative cough or neck pain, and in whom adequate indirect or mirror laryngoscopy cannot be done. Subjects for direct laryngoscopy are infants, young children, unconscious or anesthetized patients, and some adults in whom complete exposure and study of the larynx by mirror cannot be made. This study is generally necessary in lesions of the laryngeal ventricles, in the examination of regions below protruding masses and in some subglottic lesions.

Direct laryngoscopy is indicated, secondly, for treatment when adequate treatment by indirect laryngoscopy is not feasible and when external surgery is not required for the security of the patient or the extent of the disease. The indications for direct laryngoscopy are extended, to my mind, too freely by many laryngologists, particularly in its use in biopsy and therapy. We must bear in mind that direct laryngoscopy is uncomfortable and is attended by some degree of postoperative distress even when it is performed by the most skillful and dexterous of endoscopists; furthermore, we can accomplish, very often, exactly the same end by indirect laryngoscopy without the discomfort of direct examination. On occasions, direct laryngoscopy as a therapeutic procedure is distinctly unsatisfactory. I have seen patients with vocal nodules and with polypoid degeneration of the cords in whom removal of the growth under direct laryngoscopy was attempted with only partial success. This is due to the flattening of a soft growth along the edges of the cords when they are tensed by the pressure of the direct laryngoscope. The end-result is the removal of only part of the growth, the

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central or thicker portion of the growth, which, under direct laryngoscopy, is apparently the entire growth.

With experience and patience on the part of the laryngologist, children as young as 4 years of age can be examined by mirror laryngoscopy. The necessary expenditure of time and patience in training young children to permit manipulation in the larynx for therapy is not warranted today. The saving of wear and tear on the nervous system of both physician and child by using direct laryngoscopy and finishing the treatment quickly more than compensates for the discomfort of the endoscopy.

I have dwelt on indirect laryngoscopy at some length because I believe direct examination should be done only when necessary, for the reasons and with the indications mentioned above.

The specific discussion and illustration of the indications for direct laryngoscopy would require a fair-sized volume; however, a few special points require emphasis. In infants, laryngeal disease is commonly expressed by alterations in the voice, by unusual sounds, such as stridor, or by respiratory difficulty. Direct examination is indicated under these circumstances no matter how young the infant may be. The local findings can often be fairly accurately foretold from the history and the physical examination of the infant, but surprises are common. Whether a cyst, tumor or web is present in the larynx of an infant can be determined only by direct examination. The therapy follows the findings. Papillomata are a comparatively common condition requiring direct examination for diagnosis and treatment. There is a group of similar clinical pictures comprising laryngeal foreign body, subglottic edema, laryngotracheitis and primary laryngeal diphtheria. They can be differentiated accurately only by direct laryngoscopy. The totally different therapeutic measures required for the cure of these patients can be applied only after the requisite diagnostic information is gained by direct examination. Another fairly frequent condition in infants that requires direct laryngoscopy is Thomson's stridor. The chief use of endoscopy in this condition is to rule out gross organic disease of the larynx and to establish the diagnosis of Thomson's stridor. In this way we can reassure the physician and the

patient's family of the relative innocuousness of the alarming symptoms.

The removal of persistent vocal nodules in children is advisable for a number of reasons. It can be done speedily with direct laryngoscopy. The tendency of nodules in children to flatten out under direct laryngoscopy is very slight, in contradistinction to adults, because of the slenderness of the neck and the elasticity of the structures.

The general indications for direct laryngoscopy in adults have been stated earlier in this paper. The estimation of the distance of the lower edge from the upper edge of ulcers or tumors and the determination of the vertical extent and location of a lesion often requires direct examination. This information is necessary to decide on the proper operative procedure.

The study of laryngeal regions below projections, such as tumors or deformities, and the investigation of ventricular lesions, particularly those hidden by a protruding ventricular band, often require direct endoscopy. The great majority of tumors and ulcers can be examined and subjected to biopsy by mirror laryngoscopy, but one type requires direct examination. This is an infiltrating submucous malignancy arising usually from a small, hidden ulcerating carcinoma of the subglottic region. There are contour changes in the superjacent larynx, which, while they hide the primary subglottic lesion, show no surface evidences of malignancy. The discovery of the primary subglottic lesion and the determination by biopsy of the malignant nature of the submucous infiltration underlying the contour changes of the larynx require direct laryngoscopy.

In laryngeal tuberculosis, direct endoscopy is at times necessary, although the majority of cases are best treated indirectly. Direct laryngoscopy is indicated particularly in tuberculosis involving the ventricles. Laryngeal strictures and webs and chronic subglottides require repeated direct laryngoscopic treatment.

Direct endoscopy is useful in thyroid surgery, especially in extensive or complicated operations. The direct observation of the larynx during the operation is desirable in this type of surgery if bilateral recurrent paralysis is to be avoided; or if

the surgeon wishes to remedy by revising the operative field, a unilateral paralysis as soon as it occurs. These unfortunate accidents occur in spite of all precautions by skillful surgeons. If restitution of the integrity of the recurrent nerve can be accomplished at once, the injury may not be a permanent one. Dyspnea due to cord paralysis or tracheal collapse can be foreseen and, if necessary, tracheotomy can be done before the wound is closed. In this way severe damage to the patient and emergency tracheotomy some hours postoperative can be avoided.

While mirror examination of the trachea is possible in many patients, for uniform success in the diagnosis and treatment of tracheal disease, recourse must be had to direct endoscopy. The signs and symptoms of tracheal disease are often vague in the early stages and are similar to those found in bronchial disease. Definite diagnostic signs are absent as a rule and direct endoscopy must be done at times as an exploratory procedure. Discussion of the indications for direct tracheoscopy can be included in that of bronchoscopy. There is one special and important indication for direct tracheoscopy and that is as a preliminary to tracheotomy. The passage of a tracheal tube below the obstruction immediately relieves the patient's dyspnea and converts an emergency bloody operation into a routine leisurely procedure.

The indications for diagnostic bronchoscopy are the presence of symptoms and signs relating to the lower respiratory tract; that is, trachea, bronchi and lung, which are not definitely accounted for by accurate diagnosis. The symptoms are cough, expectoration, hemoptysis, wheezing, dyspnea, chest pain. The signs are localized dullness, rales or wheezing, recurrent nerve paralysis, and X-ray findings of infiltration, atelectasis, cavitation, mediastinal or root shadows, and phrenic nerve paralysis. Diagnostic bronchoscopy is indicated, in addition, whenever deviations from the usual course of a thoracic disease are not accurately explained.

Strictly speaking, one feels justified in performing bronchoscopy only because the information derived through it may be of some value in the treatment of the disease. It would be desirable, therefore, to have some way of deciding which symptoms have a significance for bronchoscopy. Unfortunately, this is possible only in a limited sense. If we take any

of the symptoms of bronchial or pulmonary disease, such as coughing, stridor, dyspnea, hemoptysis, it cannot be denied that one or all of them may, in a specified case, be caused by a disease in the air passages, which only bronchoscopy would discover. Yet no one would assert that these symptoms are in every case an indication for bronchoscopy, because ordinary physical examination might suffice to discover their cause. Whatever limitation may theoretically be placed on the indications for bronchoscopy, my experience as bronchoscopist with a thoracic group has impressed me with this fact: except in the simplest of cases, in which the diagnosis may be made by the ordinary methods, it is not wise to omit a visual exploration of the airways. Otherwise unsuspected pathological changes whose discovery may lead to curative treatment may be missed.

When these symptoms occur as a result of acute or chronic bronchitis, aortic aneurism, pulmonary embolism, cardiac disease, pulmonary emphysema, allergic asthma, acute lobar or bronchopneumonia and most cases of pulmonary tuberculosis, bronchoscopy is not indicated; however, exceptions to this statement must be noted. In cases of pulmonary tuberculosis with persistently positive sputum in spite of apparently adequate therapy, such as thoracoplasty, bronchoscopy is indicated to determine whether a bronchial lesion is the cause of the positive sputum. Endoscopy should also be done preliminary to extensive surgery for pulmonary tuberculosis in order to ascertain the presence of a bronchial lesion or of bacilli in the opposite lung. Localized wheezing or localized atelectasis in pulmonary tuberculosis, as in other pulmonary conditions, requires bronchoscopy to determine the type of bronchial lesion present.

The rarer pulmonary infections due to higher bacteria, such as leptothrix or actinomyces, or by invasion by echinococcus, generally by direct spread from the liver, can be diagnosed by smears and cultures taken from the bronchi by means of endoscopy. Smears and cultures obtained through the bronchoscope are, of course, also informative in the more common infections of the lower respiratory tract.

Diagnostic bronchoscopy is important in putrid lung abscess to rule out a bronchial lesion and as an aid in localizing the abscess. By observing the branch bronchus which contains

pus and foul odor, the involved pulmonary segments can be determined. In this way the surgeon is guided in his approach to the diseased pulmonary areas. The proper surgical approach often decides whether the patient lives or dies.

Endoscopic examination in bronchiectasis is valuable mainly to rule out an obstructive bronchial lesion. For the determination of the presence and extent of bronchiectasis, endoscopy is much inferior in value to bronchography.

Recurrent attacks of pneumonia, particularly when the same pulmonary areas are involved, indicate the advisability of bronchoscopy to rule out the existence of a bronchial lesion. This should be done also in persistent empyema.

Hemoptysis is often a definite indication for bronchoscopy. If it is due to a definitely diagnosed pulmonary tuberculosis, mitral stenosis, aortic aneurism, pulmonary embolus or previously studied bronchiectasis, bronchoscopy should not be done. In other cases, bronchoscopy is necessary. Hemoptysis may be associated with other symptoms and various physical and X-ray findings in bronchial benign and malignant tumors, ulcers, pulmonary suppuration, etc. But in two groups of cases hemoptysis may be the sole symptom. In the first group we have small bronchial tumors which cause no obstruction or inflammatory complications. If the bronchoscope and the patient are fortunate enough to meet at this stage, the disease can be cured quickly. In the second group, not only are there no physical or X-ray findings, but bronchoscopy is negative except for the presence of blood during the active stage of hemoptysis. This group is fairly large. The patients are women who have attacks of hemoptysis at varying intervals and no other symptoms. Harry Wessler has described this condition as essential hemoptysis which he ascribes to fragility of the blood vessels in the bronchial mucosa. It is not due to varicosities of the bronchial vessels but to an abnormal tendency of the mucosa to bleed, which can be demonstrated by gentle manipulation of the mucosa through the bronchoscope.

Therapeutic bronchoscopy is with few exceptions indicated only in obstructive bronchial lesions or for the removal of secretion in the bronchi. These lesions, however, are numerous and produce varied symptoms, signs and clinical conditions.

The endoscopic therapeusis of acute tracheobronchitis is the removal of obstructing secretions and exudate, and temporary shrinkage of the mucosa to a slight extent. Its use in membranous or fibrinous bronchitis, as in allergic disease or diphtheria, is also the removal of an obstruction. The removal of foreign bodies, broncholiths or caseating material from perforating glands serves the same purpose. The dilatation of strictures is indicated in some instances. If the stricture is fairly thin and the bronchial wall, particularly the cartilage, seems intact, treatment by dilatation is valuable. Thick strictures associated with destruction of the bronchial cartilages, as is often the case in tuberculosis, are best left undilated. Dilatation of such stricture if achieved lasts for only a short time, and rapid progression of the bronchopulmonary disease below the stricture is usually the sole reward of one's efforts.

Bronchoscopic treatment of acute putrid lung abscess has relatively little value today. The results of external surgery when performed by a competent thoracic surgeon conversant with the proper management of the treatment of lung abscess are so far superior to those of any method of treatment that it should be the treatment of choice. Spontaneous cure of lung abscess occurs in about 35 per cent of cases (Wessler); Yan-kauer and I reported 17 per cent additional cures by bronchoscopic treatment; Neuhoof and Touroff, in 82 cases treated by thoracotomy, obtained over 95 per cent cures. Chronic lung abscess should not be permitted to occur, because it is generally an intractable disease which usually ends fatally in a few years. Bronchoscopic treatment of chronic lung abscess is only occasionally useful, and external surgery is difficult and frequently unsuccessful. Let the thoracic surgeon operate the acute cases early, use bronchoscopy only as an aid to diagnosis and localization and there will be few chronic abscesses and a large number of cures in this dreadful disease.

A pleasant experience is the bronchoscopic treatment of massive pulmonary collapse, particularly the postoperative type. Here, again, we act by removing an obstruction; for example, thick secretion, often gluey in consistency. However one conceives the mechanism of the causation and of the cure of postoperative massive collapse, the fact remains that often these cases clear up in dramatic fashion after removal of bronchial secretion. No matter how close to the last gasp these

patients may be, the presence of signs of massive collapse demands immediate bronchoscopy. It is amazing to see the immediate response to bronchoscopic treatment in one who, responding in no way to any other form of therapy, lies purplish and gasping for breath in an oxygen tank. Concern about rupture of a recent abdominal wound is unnecessary provided the bronchoscopy is done expeditiously and gently. Repetition of the bronchoscopic treatment is occasionally necessary after 24 or 48 hours. Bronchoscopy is not always needed in postoperative atelectasis. Many of the milder cases clear up with less drastic methods of treatment, such as change of position, carbon dioxide inhalations, etc. But if these methods are not efficacious, bronchoscopic treatment should be instituted before secondary suppuration, permanent atelectasis and bronchiectasis result.

Bronchoscopic treatment of bronchiectasis is directed to the removal of a primary obstructive lesion, if present, with the hope that the ectasia, or at least the infection associated with it, will subside. Treatment of the type of bronchiectasis due primarily to a parenchymal lesion, which is the most frequent type of bronchiectasis, is one of the exceptions to the principle of removal of obstruction in bronchoscopic treatment. Bronchial lavage is employed in these cases, with temporary improvement in some patients and a small number of clinical cures, that is, absence of secretion and cough, in others. By and large, it is not worth the effort except in those patients in whom other methods do not relieve the cough and expectoration and in whom external operation is not feasible. Bronchoscopic treatment may be tried twice a week and if the results are favorable the intervals between treatments may be lengthened.

At the present time, the endoscopic treatment of tuberculosis has a limited usefulness. Stenotic lesions of the bronchi are usually best left undilated, as I mentioned before. Granulations may be removed and the base cauterized to facilitate healing. Ulcers may also be cauterized or fulgurated. In some instances the bronchi are filled with thick secretion from the lung or grumous material from a perforating gland. Endoscopic treatment is indicated for the removal of these products to relieve obstruction and prevent spread of infection to other bronchi.

External operations on the lung are at times followed by spill-over infections in previously unaffected lung areas. This occurs in patients with large amounts of secretion in the bronchi. In order to prevent the spill-over of retained secretion and the secondary infection, it is advisable to bronchoscope the patient just before the external operation is begun and to aspirate all visible secretion. If the patient is requested to cough when the aspiration is ended, additional secretion may be expelled and thus removed from the more distal bronchi.

Bronchoscopic treatment of tumors is directed mainly to the removal of obstruction. The treatment of disease factors other than obstruction, such as the eradication of malignancy, is rarely indicated and less often is it successful. Most benign tumors, such as benign adenoma, polypi, fibroma, etc., can be removed bronchoscopically with good results. In about 10 per cent of benign adenoma the growth extends outside the bronchial walls and can be successfully treated only by external surgery. Benign adenomata occur in over 6 per cent of all bronchial tumors (benign and malignant). Since these growths are generally confused with malignant tumors, the early recognition and treatment by bronchoscopy of these cases will reduce the mortality in bronchial neoplasms by about 6 per cent.

The eradication of malignant bronchial growths has been, in my experience, a failure as far as lasting results are concerned. In a very few instances freedom from symptoms for a period of several years has been obtained in the less malignant types by endobronchial coagulation and radium application. A second therapeutic application of bronchoscopy in malignant tumors is the determination of the site and extent of the bronchial tumor as a preliminary to external surgery. This may be determined quite accurately in some cases, and in conjunction with the Roentgen films, the indications for the extent of lung resection can be set. A third therapeutic use in malignant growths is a palliative one that is at times helpful. This consists of freeing the bronchial lumen of obstructing growth and of the evacuation of retained pus. As a result of pulmonary suppuration below the obstructing growth, a patient may have high fever and may be very toxic. It is possible to remove the major part of the obstructing

growth and by aspiration of the secretions and ventilation of the distal portions of the bronchial tree, the fever and toxemia will disappear. Life can be prolonged for some months in this manner and the patient can be kept comfortable and fairly active by the repetition of this treatment when indicated.

We, as laryngologists and endoscopists, may set the indications for direct examination and treatment in laryngeal and bronchial diseases, but the most important indication is the education of the general practitioner, internist, pediatrician and surgeon. As one of the members of my staff said, "the pediatrician should be told that croup must be seen as well as heard." All is not croup that crows.

Of what use is it to agree among ourselves that bronchoscopy is indicated in so-called unresolved pneumonia if the indications have not been brought to the attention of the general medical practitioner or internist who treats the patient week after week, month after month, hoping for resolution of the atelectatic lung, which in the meantime is becoming fibrotic and bronchiectatic? All this time, the opportunity was lost for cure of the patient's symptoms and of the unresolved pneumonia by bronchoscopy and removal of a benign tumor. This is a frequently repeated story which belongs in the annals of the medicine of yesterday and not on today's hospital admission charts.

As important as our knowledge of the indications for peroral endoscopy is the transmission of this information to and the education of the internist and surgeon.

121 East 60th Street.

SYMPOSIUM ON PERORAL ENDOSCOPY.

(d-2)—INDICATIONS FOR ESOPHAGOSCOPY, GASTROSCOPY AND
DUODENOSCOPY.*

DR. CHARLES J. IMPERATORI, New York.

SYLLABUS.

Esophagoscopy is the branch of peroral endoscopy that deals with the esophagus.

GENERAL FACTS.

A careful study of the esophagus by the use of contrast media and the X-ray should always precede esophagoscopy.

The esophagus presents a problem entirely different from the bronchi. It is a collapsible tube which lies against the lumen of the esophagoscope, so that one cannot see ahead of the instrument as well as one does in the bronchi. Further, the esophagus does not lie in a straight line, and it has a number of constrictions which add to the difficulty of esophagoscopy. The wall of the esophagus is very thin. Esophagoscopy must be considered as a surgical procedure.

INDICATIONS.

General: For diagnostic observation. For removal of foreign bodies. When there is interference with the function of the esophagus. For the biopsy of tumors or their endoscopic removal. For treatment by direct medication, application of radium, or its implantation.

For diagnostic observation and when there is interference with function, X-ray studies should always precede esophagoscopy.

Specific: Congenital malformations, deviations that may be congenital or acquired.

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(Normally, the esophagus is free in the mediastinum from the lower part of the trachea to the cardia, and its direction is from right to left and from before backward.)

In the thorax, inflammatory lesions, tumors, enlarged lymph abscess, enlarged lymph nodes, malignancies may induce a change in the direction of the esophagus.

In the cervical region, an enlarged thyroid, mediastinal nodes, pericarditis, dilatation of the heart, aneurysm and various pulmonary lesions, tuberculosis and syphilis, and lesions of the vertebrae, kyphosis, scoliosis, dislocation, fractures — the above-mentioned lesions may compress, deflect and distort the esophagus and thus interfere with the function.

Spasm of the muscular coat of the esophagus usually occurs at the upper or lower part. In the first instance it is called esophagismus, and in the latter cardiospasm, and usually with these symptoms there is a dilatation, depending on the length of time that the muscular spasm has existed.

Atony and paralysis of the esophagus require investigation. (A paralysis of the esophagus, in its upper part, is usually present in the various syndromes affecting the nucleus ambiguus.)

Diverticulae, either pulsation or pharyngoesophageal, or those within the mid- and lower thorax, are termed traction diverticulae.

Varices of the esophagus occur in those patients in whom the portal circulation is obstructed, or diseases of the spleen, pancreas and stomach.

Acute and chronic esophagitis, with symptoms of regurgitation, vomiting, dysphagia, aphagia, constant drooling of mucus, should be investigated to determine the cause of the loss of or disturbance of function.

Peptic ulcer, tuberculosis, syphilis, diphtheria (mainly post-diphtheritic stenoses), urticaria, angioneurotic edema, herpes, pemphigus, agranulocytosis and parasites.

Actinomycosis, sporotrichosis, trichinae, filaria are very rare but do occur.

(These conditions can only be determined, during life, by esophagoscopy.)

Traumatic lesions, such as gunshot wounds, perforations, rupture, abscess, strictures following corrosives.

Tracheoesophageal fistula, either congenital or acquired.

Tumors may be benign, such as cysts, fibroma, polyps, adenoma, leiomyoma, angioma, lipoma, myxoma, and malignant-primary or secondary carcinoma, and sarcoma.

For the removal of foreign bodies.

For biopsy or endoscopic removal of new growths, benign or malignant.

For treatment, by direct medication, use of diathermy current in the desiccation of vascular growths or the implantation of radium emanations. This latter is simply mentioned, for I do not consider this procedure a safe one.

GASTROSCOPY.

This is the art of inspecting the mucosal wall of the stomach through an endoscope. It may be done perorally or through a gastrotomic fistula.

There are several types of gastroscopes — the rigid and the flexible. Also the open type with a window at the proximal end. The flexible instrument of Schindler is the instrument of choice.

ANATOMIC AND PHYSIOLOGIC CONSIDERATIONS.

For the purpose of orientation, the stomach may be divided into the large cardiac part and the smaller pyloric. The cardiac part consists of the fundus and body. The fundus is that part which lies above a horizontal plane passing through the cardiac orifice. The body is entirely to the left of the median line. The pyloric part consists of the pyloric vestibule and the pyloric canal, which continues into the duodenum.

Peristalsis begins as soon as food enters the stomach. When the stomach is empty it is contracted. There is usually a certain amount of gas in the stomach so that the walls are not in complete contact.

Peristaltic waves begin near the center of the body of the stomach and are usually seen nearer the greater than the lesser curvature. Waves occur every 15 to 20 seconds and there may be two or three at the same time. While food is in the stomach the pyloric canal is closed, or partially so, and as each peristaltic wave approaches the pylorus the sphincter relaxes. Cannon has shown that relaxation of the pyloric sphincter is inhibited whenever the mucous membrane of the stomach comes in contact with substances that might injure the duodenum, such as insufficiently chewed masses of food and very hot or very cold food. When the stomach is empty the pylorus is relaxed. In the recumbent position with an empty stomach, regurgitation from the duodenum may occur.

INDICATIONS.

To determine the gastric movements and the pyloric action:

In any suspected lesion of the stomach wall that cannot be demonstrated satisfactorily by X-ray, or when the clinical, X-ray and laboratory findings do not coincide, diagnostic gastroscopy is indicated.

The differentiation of a benign lesion of the stomach wall from a malignant one may be accomplished by biopsy, through the open type of instrument.

For the removal of a foreign body, especially one that has passed spontaneously into the stomach and has not passed out, after a period of many days, gastroscopy guided by the fluoroscope should be done.

CONTRAINDICATIONS.

Disease of the esophagus, particularly ulcerative esophagitis following the swallowing of corrosives or caustics:

Cancer of the esophagus.

Hematemesis.

Ulcer of the stomach, definitely diagnosed.

Cardiac weakness.

Debility and other esophageal contraindications.

DUODENOSCOPY.

This consists in the inspection of the mucosal wall of the duodenum through an endoscope, either perorally or through a gastrotomic fistula.

Peroral duodenoscopy is still in the experimental stage of development. This procedure is accomplished with a lens type of elongated cystoscope guided into the duodenum through the esophagus and stomach on a thread that has been previously swallowed and anchored in the lower intestine.

General Facts: The duodenum¹ was originally so named because its length is approximately 12 fingers. It extends from the pylorus to the duodenojejunal flexure. It is divided into a superior descending and inferior portions. The inferior part is again divided into the horizontal and ascending portions so that there are really four subdivisions. The duodenum generally presents the typical characteristics of the small intestine. The superior part has no valvulae conniventes. The descending part contains the orifices of the common bile duct and the pancreatic duct. There is a longitudinal fold on the posterior surface of this part of the duodenum. It is at a right angle to the valvulae conniventes, and is the only permanent longitudinal fold in the small intestine. This fold is produced by the common bile duct crossing the intestinal wall diagonally. Where the fold ends is the diverticulum of Vater and is the exit of the bile duct and that of Wirsung. There are many combinations of openings of these ducts, frequently opening separately. There is also an accessory duct of the pancreas (Santorini) opening nearer the pylorus.

In visualizing the interior of the duodenum, the landmarks sought are the absence of valvulae conniventes in the first part of the duodenum, about 2 cm. of surface, and their presence in the second part. Approximately 7 cm. from the pylorus is found the diverticulum of Vater, which is found by following down the posterior wall and identifying the longitudinal fold.

Visualization of the interior of the duodenum is done through the medium of water, similar to a cystoscopy. Inflation with air is not satisfactory and there are many possibilities of danger. Injection of radiopaque material into the ducts produces Roentgenograms of the bile duct, gall bladder, ducts

of the liver, and the ramifications of the duct of Wirsung in the pancreas.

Inasmuch as this whole topic is purely experimental and in a stage of development, I have felt, with my associate, Dr. E. Hanssen, that great caution must attend practice of this procedure on the living; however, I do feel that there are many possibilities, and what may seem to be a fantastic procedure today will be an accepted one of tomorrow.

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108 East 38th Street.

SYMPOSIUM ON PERORAL ENDOSCOPY.

(e)—CONTRAINDICATIONS TO ENDOSCOPY AND ACCIDENTS.

DR. JOHN D. KERNAN, New York.

The topic assigned to me tonight is "Contraindications to Endoscopy and Accidents." When I first considered the matter there seemed to be no contraindications. Certainly, a procedure called for, to make a diagnosis or relieve suffering, especially in an urgent case, is not ordinarily contraindicated. Considering the matter further, however, I concluded there are certain conditions which should, at any rate, make one pause before carrying out an endoscopy.

In connection with very young children, where there is inspiratory stridor, naturally it is desirable to know the cause of the stridor. But, suppose it is a baby only a month or so old. In such little children it must be remembered that any interference, such as a laryngoscopy, may upset the balance and change the stridor into an urgent dyspnea. It is better, then, in case of very young infants to postpone if possible the direct examination until the child is older. Should a bronchoscopy be necessary, if the bronchoscope is in more than a very short time, the subsequent subglottic swelling may cause alarming symptoms and make necessary a tracheotomy. Age, then, or rather lack of it, may be a contraindication to bronchoscopy.

In connection with acute inflammatory diseases of the larynx in children, this should be remembered, that even the laryngoscopy, however gently performed, may cause enough trauma to shut off the larynx; therefore, it is always absolutely necessary in such cases to be prepared to pass a bronchoscope and perform a tracheotomy either immediately or at any time in the next 24 hours. Thus, although acute inflammatory conditions in the larynx are not a contraindication to laryngoscopy or bronchoscopy, they should at least make one hesitate.

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Another circumstance to be remembered is that after one bronchoscopy, another should not be performed until the reaction to the first has subsided. Thus, if an attempt to remove a foreign body has been unsuccessful, the bronchoscopy should not be immediately repeated unless, of course, the nature of the foreign body makes such a repetition urgent. If difficulty in breathing then appears, a tracheotomy should be done without much delay. In connection with adults, there is not the same objection to doing a bronchoscopy in the face of an acute infection of the larynx as there is in children. In both, however, the danger of introducing infection deeper into the lung must always be kept in mind.

Recently we were called upon to decide upon a bronchoscopy in the case of a child, age 9 years. This child had for a long time a shadow in the right upper lobe which indicated collapse of that lobe, secondary to blocking of the right main bronchus. The original condition had been thought to be tuberculosis. The child had never been bronchoscoped. Presently it was thought desirable to do a bronchoscopy to ascertain, if possible, the cause of the bronchial blocking. The question was raised by some pediatricians as to whether a bronchoscopy and the instillation of lipiodol would not stir up the tuberculosis; in other words, are bronchoscopies and instillation of lipiodol contraindicated in tuberculosis? My own opinion is, certainly not if there is a clear idea as to why the bronchoscopy is being done. The X-rays in this case are unusually interesting, showing a dense shadow at the apex of the right lung. It was supposed to be due to blocking of the upper lobe bronchus. When we bronchoscoped the case, the mouth of the upper lobe bronchus could not be found. At the site of the middle lobe bronchus there was a branch leading outward in the direction ordinarily taken by the upper lobe branch. Our conclusion was that the child had had an ulceration of the bronchus which had healed, completely closing the upper lobe branch. The upper lobe had collapsed, the middle lobe had expanded to fill the chest with a distortion in the direction of its branches as indicated in the film.

A sure contraindication in adults is the presence of an aneurysm. No one would be inclined to bronchoscope a patient with a known aneurysm on account of the great danger of rupture with hemorrhage. Yet I have done it several times without disastrous results. In cases of tumor in the mediastinum, the nature of which is not known, be it glandular, neo-

plastic or an aneurysm, it is sometimes important to make the diagnosis. In such a case, bronchoscopy very carefully done may be allowable, even though it may uncover an aneurysm.

Another contraindication to bronchoscopy is active hemorrhage, or recent hemorrhage. Bleeding is always a great danger during a bronchoscopy, for you must remember that when the tracheobronchial tree is anesthetized, the cough reflex is suppressed, and the patient may drown in his own blood before anything can be done about it. A word of warning here. If during the course of a bronchoscopy, active hemorrhage does start, it is probably better to keep the bronchoscope in and remove the blood by suction rather than to trust to the cough to remove it. Contraindication to recent hemorrhage doesn't always hold. Suppose there is a vascular tumor which bleeds every two or three days. We know that this vascular tumor may be destroyed by diathermy. Certainly it would be the height of folly to withhold a bronchoscopy under such circumstances.

Another contraindication in bronchoscopy might be laryngeal tuberculosis. Certainly the trauma caused by passing a bronchoscopic tube through a tuberculous larynx would be something not lightly to be thought of. And yet if the tuberculous laryngitis was a secondary to tuberculosis of the trachea and bronchi, I feel that healing of the larynx might be promoted rather than prevented by treatment of the tuberculosis lower down in the air passage. I have on one occasion temporarily disregarded tuberculosis in the larynx for the sake of treating tuberculosis in the trachea with ultimate good results at both sites.

Age then, acute inflammation, sometimes tuberculosis, either laryngeal or pulmonary, aneurysm and hemorrhage may be contraindications to direct laryngoscopy or bronchoscopy.

Now as to accidents. Of course, there should be no accidents. Any accident would be the result of trauma, and gently performed bronchoscopy should not be traumatic. The question of anesthesia enters here. A tube like the bronchoscope naturally has a tremendous leverage and if it is misdirected or the patient makes sudden, uncontrollable movement there will be trauma. This can be avoided by proper use of sedatives in adults with careful use of local anesthesia, and a general anesthesia in children who cannot be controlled by holding.

In my opinion, it is much more dangerous to bronchoscope a struggling child than one well controlled by a general anesthesia and, also, it is possible to work more quickly and accurately.

How may the lungs be traumatized otherwise than by the tube? Well, in the case of foreign body, consider the question of a staple upside down, one end buried in the wall of the bronchus. Only very gentle manipulation of such a staple will turn it over and allow its successful removal. If it were grasped by strong forceps and pulled out by main force there undoubtedly would be a fatal accident. I have participated in one fatal accident in the removal of a foreign body. A woman had worn a tracheotomy tube for 20 years; she had worn one tube so long without changing that the part in her trachea had rusted off and, broken into three pieces, had fallen into her bronchial tree. There is no telling how long they had been in that position. They were removed without undue trauma and yet she died 24 hours later from a tremendous thoracic emphysema. Evidently the end of one had been pointed into the bronchial wall in such a way as to tear a hole as it was removed.

For foreign bodies, never, never, never use a sharp hook in the tracheobronchial tree. On two occasions when removing foreign bodies, in an endeavor to bring it to position where it could be grasped by a forceps, I have passed such a hook beyond the foreign body and got it caught. Imagine such a predicament! It could not be pulled away; it had a round shaft, so that it was difficult to tell the direction of the point. Only manipulation for about 15 minutes released it so that it could be removed. One of the foreign bodies was a peanut; it had been very difficult to get hold of. The manipulation required to release the hook so loosened up the peanut that immediately after the removal of the hook, the peanut was coughed out through the tube.

The question of accidents from hemorrhage here comes up. I have already warned you that in the face of active hemorrhage, bronchoscopy should not ordinarily be undertaken. On one occasion I saw a man who had had a dime in his left main bronchus for 20 years. For a long time it caused him no inconvenience but latterly he complained of tremendous hemorrhages. In such a case, naturally, a bronchoscopy was not contraindicated. Unfortunately, he was given a general anes-

thesia. As soon as the dime was touched, a furious hemorrhage ensued, which was fatal. His cough was suppressed by the anesthetic. Of course, it is possible that the foreign body, being in place for a long time in the left main bronchus, had eroded into the aorta. If that were the case, no care would have prevented the fatal result.

Accident from hemorrhage may occur in the course of cauterizing a tuberculous ulcer. In treating a flat ulcer, when the coagulator was applied a vessel was penetrated which bled furiously. Unfortunately, the bronchoscope was removed. That was a mistake. The patient could not clear her lungs herself and by the time the bronchoscope had been put back and several large clots sucked out she was dead. On a number of occasions I have seen lung hemorrhages which were successfully treated by leaving the bronchoscope in place, removing the blood as quickly as possible by suction and injecting adrenalin through a suction tube.

Accidents may occur when removing biopsy material. Consider this case, of which I show you a slide and of which I am going to make you a drawing. This woman had an ulceration in the left main bronchus; beyond it, as you see, situated on a spur was a tumor mass. As it moved up and down during respiration, it appeared exactly like a foreign body. If it were taken to be a foreign body, one would naturally grasp it by one end with a turning forcep and pull it through the granulations above the body presenting its short transverse diameter. Some of the turning forceps have long, sharp prongs. If one end of that tumor were grasped with one of these turning forceps the points might very well penetrate the walls of the spur and permit an emphysema to arise in the mediastinum. I took hold of this one with a forceps, but not one with sharp points. When I pulled on it, it didn't come easy, so just as you must always do, I stopped pulling and then realized that it was attached to the bronchial wall. In other words, not a foreign body, a tumor. I took a biopsy of it which proved it to be tuberculous. A caution about taking biopsy of spurs: Make sure that you are not taking such a big bite that you will bite right through the bronchial wall.

What is the best prophylaxis against accidents during bronchoscopies? Gentleness, more gentleness, and when you have used up all that, borrow some more gentleness.

103 East 78th Street.

SYMPOSIUM ON PERORAL ENDOSCOPY.

(f)—SINGLE AND BIPLANE FLUOROSCOPY.*

DR. FREDERICK M. LAW, New York.

In endoscopic removal of foreign bodies in the air and food passages, single and biplane fluoroscopic examinations are absolutely necessary. A single fluoroscopic examination is limited to the detection of the presence or absence of a foreign body, both opaque and nonopaque. In the detection of the opaque foreign body, the procedure is simple, and accurate determination of the position of the foreign body is easily accomplished.

In the case of nonopaque foreign bodies, the procedure is more complicated and depends upon the change in the transparency of the lungs, the position of the heart and the action of the diaphragm; fluoroscopic examination must be confirmed by X-ray in both inspiration and expiration. The details of these changes are too long for this short paper.

The biplane fluoroscope is used to direct the movements of instruments for the removal of foreign bodies, both opaque and nonopaque, and no bronchoscopist should attempt the removal under the guidance of the biplane without having observed the image of the fluorescent screen; and there must be the closest co-operation between the bronchoscopist and the Roentgenologist.

The instrument and the foreign body, if opaque, are visible, but the soft tissues are transparent and one must be careful in manipulating the instrument to avoid damage to the soft structures between the instrument and the foreign body. When the foreign body is beyond the vision of the bronchoscopist, the movement of the instrument must be under the direct instructions of the Roentgenologist, and the bronchoscopist must train himself to subserve his desires to the directions of the Roentgenologist. This is extremely difficult and requires considerable training. The Roentgenologist must give specific directions in as abbreviated a manner as possible,

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and when the bronchoscopist is told to "hold" he must endeavor to retain his instrument in exactly the same place until told to move it. The Roentgenologist must shift his line of vision from a perpendicular plane to a horizontal plane, and the instrument must not be moved during the time of shifting vision, otherwise his appreciation of the relationship between the foreign body and the instrument will be ruined.

Incidentally, all unnecessary visitors must be excluded from the room. The natural tendency is for visitors to attempt to see the view on the fluorescent screen and this interferes with the free movements of the Roentgenologist.

The biplane table is of a special construction, with sliding top, the end of the table being narrow so as to allow the patient's shoulders to be dropped and arms placed alongside and under the table, to enable the fluoroscopic screen to be placed in close contact with the chest and well up into the axilla.

There are two X-ray tubes, one placed alongside the table in a vertical position, thus permitting the horizontal ray to pass through the patient. This tube must be adjustable in the vertical and horizontal positions and fastened. The second tube is beneath the table, passing a vertical beam through the patient, and fastened. After the adjustments are made, the vertical and horizontal tubes must be locked together.

The fluorescent screen may be single or double. If single, it must be adjustable in the horizontal and vertical positions. If double, they must be fastened to move in unison and the entire screen carriage locked to the tube carriages. Thus, the tubes and screens move in unison and when adjustments are made they are locked to the table. The patient is placed on the table with the head over the end of the narrow portion in position for bronchoscopy. The foreign body is located; the vertical beam is narrowed to a small circle and centered through the foreign body, and then the tube is locked. The vision is shifted to the lateral or horizontal beam and the foreign body centered on the screen. This tube is then locked. Now we have two beams at right angles to each other, and where the beams meet within the patient is the location of the foreign body. Thus, the relationship between the instrument and the foreign body can be determined in two directions. Any change in the

position of the patient or adjustment of the tubes will alter this relationship. This shows the necessity for adequate training on the part of the entire crew. There must be a self-starting electric clock in the circuit of each tube. This clock is set in motion each time contact is made with either tube in order to register the time of exposure in both directions. The tubes having been accurately calibrated, the dosage received by the patient in both directions can be determined. An alarm on each clock is set to the dose limit. Accurate check can be made as to the time allowable during the operation.

I think from the above it is apparent that this operative procedure is a specialty and should not be attempted without the most thorough training. This is a rather brief description of a complicated piece of apparatus, and in order to illustrate the method better, I have prepared some motion pictures of the entire operation. They are not made from a fluoroscopic screen but by means of animated photographs on a manikin.

140 East 54th Street.

SYMPOSIUM ON PERORAL ENDOSCOPY.

(g)—PNEUMONOGRAPHY: TECHNIQUE AND INTERPRETATION.*

DR. GEORGE R. BRIGHTON, New York.

The X-ray study of pathology in the tracheobronchial tree and lungs with contrast media has been done for many years, notably by the bronchoscopists, Chevalier Jackson and Henry L. Lynah.

At first, in many instances, the contrast media were bismuth powder and bismuth in oil. It remained for the introduction of lipiodol, in 1922 by Forestier and Sicard, to stimulate interest in these studies by everyone who had any connection with lung pathology. As one can readily understand, the techniques for these studies have been different in different places and under divers conditions.

When Dr. Forestier visited the United States in the latter part of 1925, he demonstrated the technique which they were using in their clinics. The method about which they were enthusiastic was the transglottic injection of lipiodol. This method was performed by a long, curved catheter being passed down through the glottis into the trachea, after having first anesthetized the larynx and pharynx and the upper part of the trachea. They injected 20 cc. lipiodol with the patient either seated or in the recumbent position. He felt that this technique was safe, although it required a certain amount of skill, and that the only accident possible would be the injection of lipiodol into the stomach.

The second technique described by Dr. Forestier was the subglottic injection through the skin and cricothyroid membrane. He stated that this was certainly an easier method, but was not as safe as the first described technique. For this subglottic method a needle 5 cm. long and having the curve of a tracheal cannula, was used. After the local anesthesia of the skin, the curved needle was inserted directly into the trachea just in the midline of the neck, passing through the crico-

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thyroid membrane. First, from 4 to 8 cc. local anesthetic were dropped into the trachea through the needle. This caused a severe coughing spasm but in a minute or two the cough subsided and the lipiodol was then injected through the needle into the trachea. The patient was required to breathe slowly and to refrain from speaking or coughing. This procedure may be done under the fluoroscope and the stream directed to any of the lobes desired. With the anesthetic directly in the trachea, the Roentgenologist has from 10 to 15 minutes in which to make his films.

The other methods suggested by Forestier were the use of a gum rubber catheter passing into the trachea through a laryngoscope under local anesthesia, and the use of a bronchoscope and a tube passed through the bronchoscope, to be inserted into the bronchial orifices. He stated that when this last procedure was carefully carried out and proper anesthesia of the tracheobronchial tree obtained, the lipiodol could be injected into each of the main bronchial orifices.

At a meeting of the American Thoracic Surgeons in Montreal, in 1926, Dr. J. J. Singer, of St. Louis, reviewed the technique just mentioned and added an original method, which he described as follows: "The patient opens the mouth widely, the tongue is pulled far out of the mouth, and the straight cannula, which is attached to an ordinary syringe filled with the oil, is placed horizontally at the region of the base of the tongue. The patient is then requested to take a deep inspiration, during which the oil is injected. Following the injection of the oil, eight or 10 successive deep inspirations are advised, the tongue being forcibly held out and the patient requested not to swallow."

Dr. Gabriel Tucker, at the same meeting, presented the bronchoscopic method of obtaining lipiodol chest studies. His conclusions were as follows: "My experience leads me to conclude that: 1. the bronchoscopic introduction of opaque substances into the lung for pneumonography is safer for the patient and more accurate in its localization than introduction by blind methods; 2. bismuth subcarbonate insufflation as originated by Jackson has given the best results in outlining the trachea and larger bronchi, and in bronchiectatic dilatation in the larger bronchi; 3. iodized oil, 40 per cent, is best in abscess cavities and in the periphery of the lung; and 4. the

most accurate pneumonogram is obtained by the bronchoscopic introduction of the opaque substance on the fluoroscopic table. The entrance of the opaque substance is observed fluoroscopically, and the plates made without transfer of the patient to another table. These considerations justify the choice of the bronchoscopic method of introduction of radiopaque substances for pneumonography, aside from the great diagnostic value of the study of local conditions afforded by direct vision through the bronchoscope preliminary to pneumonography."

In the discussion of these two papers, Dr. John D. Kernan concurred thoroughly with Dr. Tucker in the use of the bronchoscope for the study of pulmonary pathology before injection of lipiodol, and he felt that "to a bronchoscopist, the dropping method or injecting method was horrible."

In 1936, Dr. Samuel A. Thompson introduced a procedure for study of pathology in the lungs in a very unique manner. This was not an entirely new procedure but it brought to the attention of the profession that a simple method for the introduction of radiopaque substances into each of the main bronchi was at hand. He termed this procedure bronchial catheterization because the procedure could be done without the aid of a fluoroscope with the special bronchial catheters devised by him. With this method the upper lobe bronchus could be entered and a separate study of the upper lobes be made. Dr. Thompson did not feel that this bronchial catheterization was offered as a substitute for bronchoscopy but rather it enabled the physician to follow up with subsequent examination of individual lobes after a careful bronchoscopic study had been made.

TECHNIQUE.

The patient with pulmonary disease is first studied by careful history and physical examination and stereoscopic X-rays of the chest without contrast media. Following this, a bronchoscopic examination is performed. After the withdrawal of the bronchoscope, a Coude rubber catheter is inserted through the laryngoscope into the trachea; 5 cc. larocaine are instilled into the tracheobronchial tree through the catheter before the patient leaves the operating room. By the time he reaches the X-ray department, the anesthetic has taken effect and the lipiodol study of a separate lobe can be made without inciting

a cough reflex. If the cough reflex is stimulated, the injected oil becomes disseminated throughout the lung and many times will obscure the pathology in the lobe which is to be studied. Following the injection of the oil under direct vision, fluoroscopically, the catheter is withdrawn and anterior-posterior and lateral X-rays are made. In recent months we have made a decided effort to use small amounts of lipiodol and not to flood the lobe with oil, because frequently masses of the oil will collect and overlies small stenoses and abscesses which are not visible in the X-ray. Since we do our injections under direct fluoroscopic guidance, a good deal of information can be gathered by watching the oil slowly trickle into the bronchus.

The advantage of bronchoscopic examination before any opaque substance is instilled into the lung is obvious; that is, one can study the main bronchial orifices and also the type of secretion coming from them and remove any crusts or granulation tissue which might be blocking any of the openings of the larger bronchi.

In bronchiectatic cases, particularly if there is a question of operative procedure for removal of the lobe in question, it has been our practice to examine each lobe of the lung with lipiodol at separate sessions; however, bronchoscopic examination is not essential for the subsequent examinations with the contrast media. The reason for this procedure is to ascertain as surely as is possible whether or not the bronchiectasis is limited to the lobe in question; for if an operation is performed on one lobe when the bronchiectasis involves other lobes also, the patient does not receive the expected help and the mortality rate is much higher.

In children, our technique has changed greatly in the last year or so, but we still feel that bronchoscopic examination is essential and the procedure is now carried out under avertin and ether anesthesia; bronchoscopic examination is performed; the catheter is inserted after bronchoscopy; the lipiodol injected on the fluoroscopic table and the plate taken immediately. The same conditions exist in children as in adults and we have attempted to study each lobe separately, using the smallest amount of lipiodol possible to get the desired effect.

Recently there has been a great interest among pediatricians and bronchoscopists in a condition which is variously

known as lipoid and lipid pneumonia. It has been shown definitely that the mineral oils can be responsible for a fibrosis in the lung. Many studies have been made in animals with lipiodol, and I think the general consensus of opinion is that while there have been some cases which have been sensitive to the iodine content of the oil, the vegetable oil used does not cause the reaction in the lung which is caused by the mineral oils; however, we are firmly convinced that a small amount of iodized oil to line the bronchial walls will give more information than a flood of opaque substance.

To recapitulate, the technique which is now in use at the Presbyterian Hospital for the study of lung pathology is as follows:

1. History and physical examination.
2. Stereoscopic X-ray, anterior-posterior and lateral, *without* contrast media.
3. Bronchoscopic examination.
4. Introduction of lipiodol under the fluoroscope through a catheter, studying one lobe at a time and using a small amount of lipiodol, 5 to 10 cc. rather than 10 to 20 cc., being careful to anesthetize the trachea and bronchus before the injection of the lipiodol.

INTERPRETATION.

It has never actually fallen to the forte of the bronchoscopist to interpret his own X-ray films but by co-operation between the Roentgenologist and bronchoscopist more adequate interpretation is usually available. Since the endoscopist is present at the fluoroscopic instillation of the lipiodol, he can interpret, with the aid of the Roentgenologist's past experience with chests just exactly where the lipiodol is going and what is happening to it. It is not unusual for the spilling method of lipiodol examination to report stenosis of the bronchi when what actually has happened is that the bronchial wall is covered with a thick, tenacious mucus.

In bronchiectasis it is very difficult, particularly in the early cases, to make a diagnosis on a simple anterior-posterior or lateral plate. The markings which occur in some cases of bronchiectasis are not very sharply defined and it requires a

contrast media to bring out the tubular changes. The endoscopist's point of view is very frequently helpful because he is able to tell the Roentgenologist from which bronchi the secretion seemed to be coming and whether or not there was much swelling of the mucosa of the remainder of the tracheo-bronchial tree.

In the interpretation of lung abscesses following the injection of lipiodol, not infrequently a negative shadow will be seen on the plate, which means that the abscess has not yet ruptured into the bronchus. On the other hand, if the bronchoscopist has examined the bronchus and found some secretion present, the fact that the lipiodol does not enter what is thought to be an abscess cavity will help the Roentgenologist in his final disposition of the shadow.

Nonmalignant tumors of the lung have a rather characteristic rounded, homogeneous appearance and ordinarily offer not very much difficulty in Roentgenological diagnosis. On the other hand, malignant tumors have no characteristic appearance Roentgenologically, and the study of the movements of the bronchi under the fluoroscope, combined with the bronchoscopic observations, will frequently make the diagnosis before tumor cells are found in the bronchial tree.

Irrespective of technique, there must be a close co-operation between the endoscopist and the Roentgenologist in these studies and an understanding of the limitations of both fields before the maximum efficiency can be attained in the interesting study of pneumonography.

In conclusion, I am simply reiterating again the statements which have been made by endoscopists for a long time. Irrespective of technique or facilities at hand, a bronchoscopic examination is essential before pneumonography should be attempted. As my chief, Dr. John D. Kernan, frequently has been heard to say, "There is no excuse for blindly dropping oil into a suppurative lung."

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580 Park Avenue.

THE PATHOGENESIS OF OTOSCLEROSIS.

DR. WILLIAM SPARER, New York.

The interest of otologists has recently been focused on the problem of otosclerosis by the work of Lempert,¹ fistulization of the horizontal semicircular canal, and more recently by favorable reports by Hughson,² with his much less formidable operative procedure of applying a Thiersch graft at the fenestra rotunda.

In reviewing the literature on the pathogenesis of otosclerosis we find many theories — some vague, and none entirely satisfying. All of the various theories are well summarized by Turner,³ as follows:

1. That it is a chronic, locally infective inflammatory process, starting in the mucoperiosteum of the middle ear; *i.e.*, the result of otitis media — catarrhal or purulent. The walls of the tympanic cavity, along with the ossicles and joints, are almost the only bones and joints in the body that are covered merely by mucous membrane. They appear, therefore, to be especially liable to infection from the surface. The factor of heredity, so marked in otosclerosis, may merely imply that in certain families the auditory apparatus is congenitally weak and unable to throw off completely an attack of acute otitis media. Wittmaack has produced congestion in the labyrinth of fowls by ligating veins. He claims that the consequent changes in the labyrinth capsule correspond to those seen in otosclerosis. Otto Mayer, however, does not agree, but finds evidence of spontaneous fractures of the labyrinth capsule in cases of otosclerosis.

2. Otosclerosis is regarded by some as an hereditary developmental anomaly in the postembryonic growth of the labyrinth capsule. The primary fault is an inherent defect in the living cells of the organ of hearing (Gray). Variations are more apt to occur in structures such as the cochlea which are of comparatively recent origin than in those of more ancient descent, *e.g.*, the vestibular apparatus. Otosclerosis is sometimes associated with congenital fragility of the bones and

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blue sclerotics. It is interesting to note that in all these conditions the affected structures are of mesenchymatous origin. Brunner holds that otosclerosis is a dystrophic process due to a constitutional transmissible tissue weakness.

3. Others hold that otosclerosis is due to a blood infection, and is only a part of a general toxic condition. Jenkins points out the similarity of the changes in the bone in osteitis fibrosa and otosclerosis. The cochlear capsule is affected in some cases of the former disease, but the stapes does not become ankylosed. Other observers have called attention to the similarity of the changes seen in otosclerosis to those met with in rickets and osteomalacia.

4. Nerve involvement associated with anomalies of the endocrine glands may be at the root of the affection. Frey believes that otosclerosis is associated with hypofunction of the parathyroid glands.

5. Recently Gray advanced the view that otosclerosis is due to faulty circulation at the labyrinth capsule and auditory nerve.

6. Kopetzky⁴ believes that chronic progressive deafness is a local manifestation of a general metabolic disorder.

7. Eckert-Mobius holds that there are three factors in the evolution of otosclerosis: *a.* A general constitutional factor, affecting the mesenchyma, due to inherited disturbances in the endocrine glands. *b.* Between the terminal distribution of the primary cartilage vessels and the secondary bone vessels there is a biologically feeble osseous tissue in the position where otosclerotic foci are usually found. *c.* An exciting factor: metabolic disturbances of general origin, especially seen in the female sex, or of local origin; *e.g.*, otitis media.

In otosclerosis we have a condition of progressively increasing deafness, with a normal drum and a patent Eustachian tube. It is found more frequently in females in the ratio of two to one male, and 50 per cent have a family history positive. The onset is about puberty, with progressive deafness and tinnitus. The symptoms depend on the region involved.⁵

1. *Otosclerosis at the Fenestra Ovalis:* Loss of perception of lower tones, one-half to one and one-half octaves. Rinné negative. Gellé positive. Drum normal, with possibly

hyperemia in the region of the promontory. Eustachian tube normal.

2. *Otosclerosis at the Cochlea:* Loss of perception of the upper tones and also, to a lesser degree, of the lower tones. Island deafness, as determined by audiometer. Pathological positive Rinné. Decreased bone conduction. Tinnitus. Hyperemia of region of the promontory.

3. *Otosclerosis at Semicircular Canals:* Dizziness, nausea, vomiting, tinnitus.

*Pathology:*⁵ There is an absorption of normal bone and a replacement with a spongy type of bone, which later becomes compact and less vascular. According to Cahill, there is a primary new bone formation, followed by absorption of the bone of the capsule. This initiates a resorption of new bone, and is followed by a replacement by compact bone with smaller marrow spaces. Essentially, we have spongification, bone absorption and redeposition. Areas of cartilage are calcified and metamorphosed into bone. We find halisteresis, hyperostosis and metaplasia, eventuating in ankylosis of the stapes, as a late manifestation. The tinnitus associated with this condition can be accounted for by the hyperemia.

In considering the histopathology in various types of sinusitis, it is evident that bone changes are found which are similar to those found in the inner ear in otosclerosis. In chronic sinusitis, we know that repeated infections produce fibrous changes. The vascular changes, however, are most marked, and determine the type of pathologic changes in both the soft and bony tissues which they initiate. In hypertrophic sinusitis, we have a thickening and edematous infiltration of the mucosa, submucosa and periosteum. There may be polypoid degeneration and osteoporosis and rarefaction of bone. The veins and lymphatics show the greatest amount of change from the normal inflammatory infiltration and increased fibrous tissue which replaces the lost elastic and smooth muscle tissues. Marked stasis, chronic passive congestion with extravasation of fluid into the new fibrotic tissues causes polyp formation. Veins may be thrombotic, with perivascular infiltration of monocytes and lymphocytes. The periosteum becomes edematous and the bone shows evidence of halisteresis-osteoporosis. Chronic passive venous congestion causes a

removal of calcium salts from bone.⁶ Ischemia in chronic obliterative endarteritis has a reverse effect, causing a deposit of calcium and thickening of bone, as seen in atrophic rhinitis.

It is plausible to assume that the same changes produced in the bones of the nasal sinuses by alterations in circulation due to vasomotor imbalance (which may be reflex or on a toxic-metabolic or infectious basis) may occur in the middle ear. Ischemia due to a vasospastic condition can initiate increased calcification. Chronic passive congestion with associated osteoporosis can initiate a spongification and a secondary compensatory deposit of calcium, wherein Nature over-compensates, bringing about an excessive deposit of calcium and an ankylosis of a vital joint.

Abnormal gland function is frequently associated with vasomotor imbalance. Metabolic abnormalities, similarly. Toxemia is a powerful factor for derangement of vasomotor balance. Whether of infectious or of metabolic origin, it may show a predilection for nerves in certain areas. Specific affinities may be predetermined on an "allergic" basis.

The tympanic plexus is situated over the region of the promontory, on the inner wall of the middle ear. It is made up of intercommunicating fibres, branches of the Vth, VIIth, IXth, Xth and sympathetic nerves. It receives branches from the geniculate ganglion of the facial, and Jacobson's nerve from the glossopharyngeal. It is directly connected through the geniculate ganglion, via the great superficial petrosal, which is joined by sympathetic fibres from the carotid (great deep petrosal) to form the pterygoid (vidian) nerve, to the sphenopalatine ganglion. Clinical experience⁷ confirms the belief that the great superficial petrosal nerve contains both sensory and motor fibres. Of all the elements which enter into the formation of the tympanic plexus, those which are connected with the sphenopalatine ganglion are the most likely avenues of irritating influences. The nerves connected with the sphenopalatine ganglion contain the following elements:⁸ somatic afferents, visceral afferents, postganglionic sympathetics (cervical ganglion), parasympathetic efferents (Wrisberg). All the cranial autonomic ganglia are intimately interconnected. According to Christensen, these ganglia do not include afferent or ganglion cells. He claims that the cells in the cranial, as well as the sympathetic trunks, are essentially

efferent. The cells of the sphenopalatine ganglion are mainly multipolar and efferent, and the branches from it are in part parasympathetic fibres arising from it, and in part sympathetic fibres which traverse it, and myelinated fibres which are mainly afferent components of the Vth and VIIth nerves, which also traverse through the ganglion; however the details may work out, the fact remains that the tympanic plexus through the geniculate ganglion and the otic ganglion, is intimately connected with the sphenopalatine ganglion, and nerve impulses can travel peripherally, not only via efferent nerve fibres but also via afferent nerve fibres, as they do in herpes. It has also been reported⁶ that tinnitus can be definitely influenced by injecting alcohol into the sphenopalatine ganglion. This proves that efferent irritating stimuli from the sphenopalatine ganglion to tympanic plexus can be interrupted at the ganglion.

I have shown that it is possible, on an anatomic basis, to account for vasomotor imbalance in the distribution of the fibres of the tympanic plexus — which controls the blood vessels of the middle ear — with its cause, a pathologic condition in the nasal sinuses, influencing it through the sphenopalatine ganglion. Also, that the histopathology in otosclerosis can be accounted for on the same basis as in sinusitis — bone changes being due to alteration in local circulation, which is due to a vasomotor imbalance in the sympatoparasympathetic nerves controlling those blood vessels. If the syndrome of otosclerosis is dependent on these factors, it should supply a rationale for a new avenue of approach in the prevention and treatment of this condition. Besides treatment of endocrine and metabolic dyscrasias, it would indicate, especially in cases with a family history of progressive deafness, a thorough check-up to determine any nasal pathology, and early eradication of it if found. Early serial audiograms at regular, frequent intervals to determine a decrease of tone perception at its inception and, if found, injection of alcohol into the sphenopalatine ganglion to disrupt efferent irritating impulses before they produce chronic changes in the blood vessels of the middle ear may also be indicated.

A series of cases is at present being treated along these lines with encouraging results. The series is small, and I am at present not ready with results, for it is still too early to

determine if the effects are lasting. This paper is presented with the hope that it will stimulate other men treating this condition to treat it along similar lines so that this theory may be adequately tested.

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POST-TONSILLITIC DEEP CERVICAL ABSCESS AND INTERNAL JUGULAR VEIN THROMBOPHLEBITIS.

A REPORT OF SIX CASES.*

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Suppurations of the deep cervical fascial planes are always ominous because of the serious complications which may arise, and not the least among the latter is thrombophlebitis of the internal jugular vein. Amongst the first to report this condition were Long,¹ Goodman² and Mosher.³

To understand the subject of deep cervical abscess and its relation to septicemia one must know the anatomy of the pharyngomaxillary fossa and of the cervical fascia. We do not intend to go into a discussion of the anatomy in this paper as it has been excellently covered by such writers as Mosher,³ Beck,⁴ Hall,⁵ Iglauer⁶ and Furstenberg.⁷

It is commonly known now that the so-called ordinary sore throat may be a serious disease and give rise to serious complications. Among the structures which may infect the pharyngomaxillary fossa are, according to Mosher,⁸ first and foremost the tonsils, and the chief structure from the standpoint of infection in the fossa is the internal jugular vein. Beck⁴ says that thrombosis of the internal jugular vein is one of the most fatal complications of tonsillar and pharyngeal infections. It may be associated with frank pus in the throat, or the infection may have been apparently slight and have entirely cleared up. He classifies the neck infections according to fascial plane involvement as follows:

1. Pharyngomaxillary space infection.
2. Submaxillary space infection.
3. Carotid sheath infection.
4. Cervical lymph node suppuration.
5. Prevertebral fascia infection.
6. Buccopharyngeal, pretracheal or visceral fascia infection.

In severe infections, the involvement does not remain localized to one fascial compartment; in fact, there is not infrequently an extension to the pharyngomaxillary fossa from one of the other spaces, and this should be watched for.

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Hall⁵ states there are three types of parapharyngeal infection: 1. That which follows tonsil surgery, especially when preceded by local anesthesia; 2. the type in which there is an extension from a neighboring compartment; and 3. that type in which the deep fascia is initially invaded through the parapharyngeal space and which is not preceded by any throat surgery. The etiology here is commonly in the tonsil or pharynx, although the infection in the nose, sinuses, adenoid, pharyngeal lymph nodes, cervical vertebrae, and mastoid and petrous bone are all possible sources. He enumerates four cardinal signs of involvement of the anterior pharyngeal compartment, in the order of their importance, as follows:

1. Inability to open the mouth widely; 2. induration about the angle of the jaw; 3. fever which may be septic in character; 4. medial bulging of the pharyngeal wall.

Chamberlin⁶ also considers the introduction of a local anesthetic for tonsillectomy as one of the causes of deep cervical abscess.

Shapiro,¹⁰ who reported 30 cases of deep cervical infection, expressed the opinion that the condition is almost exclusively a complication of tonsillectomy performed under local anesthesia. Hayden¹¹ reported four such cases.

It might perhaps be mentioned here that Witzhausen¹² reported a case of angina with pyemia and parapharyngeal abscess in which he claims he is sure that the tonsils were not the origin—the origin was an impetiginous eczema of the scalp caused by pediculosis.

The pathogenesis of deep cervical infection and postanginal sepsis have been amply discussed by Fraenkel,¹³ Uffenorde,¹⁴ Waldapfel,¹⁵ Schneider¹⁶ and Herrmann.¹⁷ Their conceptions are well known and need not be repeated here.

Shapiro¹⁰ classifies deep cervical infection into a phlegmonous type, in which the signs of local inflammation are predominant, and a vascular form, in which these are absent or subordinate—the symptoms from the start being suggestive of systemic involvement.

The phlegmonous form is primarily a cellulitis of the loose tissue within the prestyloid compartment and the cardinal signs are as quoted from Hall above. It should be mentioned

here that the rise in temperature is usually moderate, not exceeding from 101° to 102° F., and any considerable variation is suggestive of an additional complication; however, Gilbert¹⁸ reported a case of parapharyngeal abscess in which the temperature reached 108.8° F. The patient recovered rapidly after external evacuation of the abscess and the jugular vein was not ligated.

Shapiro¹⁰ enumerates the following as possible complications: *a.* Mediastinitis, *b.* jugular thrombosis, *c.* edema of the larynx, *d.* Ludwig's angina, *e.* fatal hemorrhage from a large vessel, probably the carotid artery, *f.* osteomyelitis of the cervical vertebrae and mandible, *g.* pneumonia, *h.* erysipelas, *i.* vagus involvement — sudden death, *j.* meningitis, *k.* parotid abscess, *l.* septicopyemia.

Hochfilzer¹⁹ and Hayden²⁰ each reported a case of deep cervical phlegmon with osteomyelitis of the mandible following local tonsillectomy.

In the vascular form of deep cervical infection, the symptoms are either those of septicemia, thrombosis or embolism without preceding or accompanying signs of cervical phlegmon.

Beck⁴ says that carotid sheath infection is secondary to infection of all the other compartments and their contained lymph nodes. Tenderness and swelling along the course of the jugular vein are unreliable signs, as these may be caused by inflamed lymph nodes, and, therefore, one should rather be guided by the degree of sepsis. Blood cultures, for that reason, should be made early in the course of the disease.

In this connection, the dictum of Mosher³ should always be remembered: "A deep cervical abscess should always be regarded as a perijugular abscess."

Although it is true that in most cases of common sore throat there is recovery in a short time, in a certain number local and systemic symptoms may develop which not only threaten life but which may prove fatal. In those cases in which sepsis develops, there is usually a latent period of 10 to 14 days in which the patient seems well. This period may vary from one to four days to from three to seven weeks.²¹ According to Hirsch,²² the nature of this disease is not to

occur immediately after a slight or even severe tonsillitis, but rather after the healing of a mild tonsillitis; therefore, the history should be given great importance and patients questioned about previous attacks of sore throats.

Perhaps I should mention here that to refer to primary jugular vein thrombophlebitis as postanginal sepsis is really a misnomer, as the infection, let me reiterate, may not only originate from the lymphoid tissue anywhere in the nasopharynx but from the bony maxillae, teeth, sinuses, gums, floor of the mouth, middle ear, mastoid and the salivary glands. In regard to the teeth as an etiological factor, it should be noted that Alden²³ reported a series of 29 consecutive cases of infection of the fascial planes of the neck secondary to dental disease in the lower jaw, and Boemer,²⁴ in a study of 75 cases of deep pus in the neck, found that involvement of the lower third molar tooth accounted for the condition in one-third of the cases in adults.

The majority of cases occur in people between 20 and 30 years of age. Waldapfel¹⁵ says that post-tonsillitis pyemia in children is one of the rarest of conditions. Reuben,²¹ on the other hand, says that it is more frequent in children than the literature indicates, he having had 10 cases (with three deaths) in children under 10 years of age in less than 18 months.

Localization on the left side has been observed to be more frequent than on the right.²⁵ The occurrence of chills is of great importance, especially when observed after the angina has subsided. Chills indicate that organisms are entering the circulation, and that the inflammatory process is not localized or walled off. In the fulminating cases, a continuous high temperature may be present, without chills, extensive metastases may occur, and the patient may die in a few days. The patient presents the general symptoms usual to a septic infection.

Rubin²⁶ says that cases reported in the literature demonstrate that thrombosis may be present without a cord-like swelling or even tenderness along the course of the jugular vein. Pyemia following acute tonsillar infections is not a rare condition and probably occurs in from 1 to 2 per cent of such cases.

Dixon and Helwig²⁷ say that, as a fatal complication of tonsillitis, thrombophlebitis of the internal jugular vein probably takes first rank. The involvement of the internal jugular vein is practically always unilateral. It causes very slight local reaction, practically no pain, there is moderate tenderness over the course of the vein and hardly enough swelling to recognize.

The thrombophlebitic process may extend in a retrograde fashion to give rise to lateral and transverse and cavernous sinus thrombosis.²⁸ The expansion of the thrombophlebitis toward the skull, from the retrotonsillar veins via the pterygoid plexus to the cavernous sinus or internal jugular vein to the sigmoid or transverse sinus is a very severe complication. It often proves fatal, suppurative meningitis being the conclusion. This complication is observed in about 10 per cent of the fatal cases.²²

Goldman,²⁹ Rosen,³⁰ Maybaum,³¹ and Stone and Berger³² have reported cases of retrograde sinus thrombosis complicating primary jugular vein thrombosis. Case 4, reported below, is such a case. In these cases there is, of course, a continuation of the septic symptoms after ligation or resection of the internal jugular vein. The occurrence of suppurative metastases after ligation should make one suspect such a retrograde extension. According to Maybaum,³¹ suspicion of retrograde extension to the jugular bulb should be aroused if the internal jugular vein is collapsed or if when the vein is resected there is an absence of bleeding from the upper stump. There may also be involvement of the IXth, Xth and XIth cranial nerves as they pass through the posterior lacerated foramen. Pain in the eye may be due to a phlebitis of the inferior petrosal sinus.

Karelitz³³ has reported a very important ear finding in these cases. This consists of a painless involvement of the ear; bluish or dark bluish-red engorgement of the drum, and even adjacent parts of the canal wall; persistence of good hearing; absence of changes in the canal wall other than that of congestion, and absence of signs of involvement of the mastoid, except possibly slight tenderness due to congestion.

Various organisms have been isolated in cases of deep cervical abscess and postanginal sepsis. The following have

been reported: Anerobic streptococcus putrificus, streptococcus hemolyticus, streptococcus viridans, influenza bacillus, staphylococcus albus.²¹ Abt²⁵ says the anerobic organisms seem to be most frequently found in postanginal pyemia; thus, the streptococcus putrificus was found frequently. The aerobic type of infection is not considered to be as malignant and, indeed, most cases of postanginal sepsis that recovered have been thought to be due to the aerobic type of infection. According to Myers,²⁸ bacteriological examinations reveal a variety of organisms. Anerobic streptococci alone and with other organisms are most frequently found. Rubin²⁶ reports that the anerobic streptococcus is the organism most frequently found, and, according to him, blood cultures are positive in about 50 per cent of the cases. In cases of deep neck infection secondary to dental disease, Spirocheta Vincenti is the predominating organism.²³

We shall now consider the question of treatment. Watson-Williams³⁴ reported seven cases of parapharyngeal abscess or, as he calls it, "the quinsy that isn't," all of which he opened intraorally, generally using a blunt tracheal dilator. In his series there were no serious sequelae.

Goodyear³⁵ reported two cases of pharyngomaxillary fossa infection in which he entered the infected space through the mouth, behind the posterior tonsillar pillar, and both cases recovered.

In the 30 cases reported by Shapiro,¹⁰ spontaneous evacuation of the abscess through the tonsillar fossa took place in eight. He considers that the indication for surgical intervention is furnished by the signs of abscess formation and the symptoms of increasing sepsis. The method of choice when there is any bulging into the pharynx is to evacuate the abscess through the tonsillar fossa.

The indications for the external operation as enumerated by him are:

1. When the abscess points externally only, *i.e.*, when no bulging of the tonsillar fossa is to be seen and the symptoms of sepsis are increasing.

2. If no drainage has taken place within 24 to 48 hours following intraoral operation.

3. If the abscess is draining through the pharyngeal incision but the external swelling and the symptoms of absorption are progressing.

4. On the imminent approach of one or more complications.

Hall⁵ believes an external operation is preferable in practically every case.

Direct external approaches to the pharyngomaxillary fossa have been described by Batson³⁶ and Kramm.³⁷ These are both retromandibular approaches.

Beck⁴ prefers to use a long incision, running parallel to the border of the jaw and extending nearly to the mastoid tip. He enters the space through this incision from behind the angle of the jaw.

When it is necessary to expose the carotid sheath, he prefers to work through a longitudinal incision having its upper end at or near the angle of the jaw and running along the anterior border of the sternomastoid muscle. Iglauer⁶ also says that the approach to the neurovascular bundle is usually made in the classic manner under the anterior border of the sternomastoid muscle.

Mosher,⁸ in searching for pus in the neck, advocates following the carotid sheath. He advises the by now classical submaxillary fossa approach through a generous T-shaped incision.

Abt²⁵ says that all writers on the subject agree that early ligation of the jugular vein is the only treatment when the diagnosis of septic thrombophlebitis has been established. Reuben²¹ feels that ligation of the internal jugular vein in all cases of postanginal sepsis is too radical a measure. He believes that the local condition and infection should be eradicated first and, if the symptoms persist, then the ligation of the internal jugular vein should be performed.

Melchior³⁸ reported good results from ligation of the jugular vein in pyemia following tonsillitis, and these results were confirmed by Riess.³⁹

Claus⁴⁰ ligates or resects the internal jugular vein, and follows this by a tonsillectomy if the patient is in good condition.

Iglauer⁶ says if the vein is seen to be occluded or collapsed, it should be uncovered, together with its tributaries, until a normal area is reached. After ligation, the diseased vein or veins should be resected.

Beck⁴¹ states that the absence of free, visible pus in a compartment at the time of operation is common and does not preclude the presence of infection. It is possible to have a macerated, necrosed vein, with completely obstructing thrombus, with no visible pus. In this respect, Ford⁴² quotes Carmody as follows: "Continue the hot poultices to bring about fluctuation in deep cervical infection and the abscess will probably open about three days before death."

It is interesting to note that Gettes⁴³ reported the development of Horner's syndrome following jugular ligation in a case of septicemia following retropharyngeal abscess. This eventually cleared up and he believed it was due to the inclusion of a filament of the ciliospinal centre in one of the ligatures.

In those cases of deep neck infection secondary to dental disease, the *Spirocheta Vincenti* usually being the predominating organism, Alden²³ routinely uses neoarsphenamine intravenously in addition to the other necessary medical and surgical procedures. Boyne⁴⁴ used it in all cases, although he admits that if the streptococcus or staphylococcus is the predominating organism, the results are not so satisfactory.

Where there is retrograde extension to the jugular bulb and lateral sinus, Maybaum³¹ says such operations upon the jugular bulb as are described in textbooks on otology are unnecessary. A complete sinus operation followed to the bulb is sufficient for all purposes. The bulb is curetted, a catheter placed in it, and daily irrigations are carried out.

Porter⁴⁵ advises that in all cases in which there is definite thickening of the vein or a thrombus obliterating the vein up to the jugular bulb, the mastoid should be opened and the sigmoid sinus explored. He is convinced that a great many of the secondary complications, such as septic emboli, are liberated through the petrosal veins and the torcula to the general circulation from an infected sinus above the jugular bulb.

As a final word, we would add that sulfanilamide has proved effective in streptococcus infections, and its use is usually indicated.

From the beginning of 1933 to the end of 1938, we have had at the Jewish Hospital, of Brooklyn, eight cases of post-tonsillitic internal jugular vein thrombophlebitis. Two of these have been reported in detail previously³² and, therefore, are not repeated in this paper.

REPORT OF CASES.

Case 1: J. D., No. 156,910, age 50 years, married, housewife, Hebrew, born in the United States, was admitted to the private service of Dr. F. E. Stone on Jan. 31, 1933.

Seven days before admission, the patient had a follicular tonsillitis, fever was present and there was difficulty in swallowing. Four days before admission, she developed a swelling in the right side of the neck, which became progressively worse.

She was a well developed, obese woman, and in no apparent pain. The eardrums were gray and flat, and she was stone-deaf in the right ear, and partially deaf in the left ear. Both tonsils were red and edematous; the pharynx and tonsillar pillars were injected. There was no postnasal discharge. The nasal mucous membrane was congested. There was a large, tender indurated mass on the right side of the neck in the region of the angle of the mandible, about four inches long and two and one-half inches wide. There was some suggestion of fluctuation in the centre of the mass and the skin over it was red. The heart was slightly enlarged to the left, and there was a systolic murmur over the base. The blood pressure was 150/96. The temperature on admission was 104.4° F.

That same day the patient had a chill and the temperature rose to 107°. A blood culture was immediately taken and she was given intravenous glucose.

On Feb. 2, 1933, the blood culture was reported positive for streptococcus hemolyticus. That day she was given a blood transfusion of 200 cc., and Dr. Leibowitz, who saw her in consultation, thought she had a jugular vein phlebitis and a deep cervical phlegmon, and he advised exploration for deep cervical abscess, and a jugular ligation. It was also noted that she had a small tender area over the gluteal region, which was probably metastatic.

Due to family protestations, operation was deferred for another 24 hours. On Feb. 3, 1933, she was operated by Dr. Leibowitz and Dr. Stone. An incision was made along the anterior border of the sternomastoid muscle, from the angle of the jaw to the sternal attachment. In the posterior part of the carotid triangle a deep abscess cavity was found in the deep cervical fascia behind the carotid sheath. This cavity contained fluid green pus and was surrounded by a sloughy, phlegmonous mass, making it impossible to demark a line of cleavage between the necrotic muscles and broken down glands.

Although dissection was continued down, and the omohyoid muscle divided, the anatomical jugular vein could not be dissected free, consisting of a fibrosed, necrotic strip of gray tissue, overlying the carotid artery, whose position and outline was determined by the pulsation. The

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abscess cavity was entered with the finger all the way up to the angle of the jaw, and a large iodoform gauze drain was inserted.

She was given a blood transfusion of 300 cc. that day.

On Feb. 7, 1933, she had a chill, the temperature rose to 106°, she became irrational and had hallucinations. That day she was given another blood transfusion of 250 cc. There was also noted some swelling and tenderness of the right hip and knee.

On Feb. 9, 1933, she was seen by an orthopedist, who thought they were septic foci, and he advised further observation.

That day her general condition was also worse, the patient appearing very toxic, there was slight cyanosis, a temperature of 104°, and there were crepitant rales and dullness over the left lower chest posteriorly, and less marked anteriorly. Portable X-ray studies of the chest the next day revealed mottling of the both lungs, suggestive of a bronchopneumonia. On Feb. 11, 1933, the heart sounds and pulse were weak, and she was cyanotic and stuporous. Oxygen was ordered. On Feb. 13, 1933, an abscess on the inner side of the left thigh was incised and drained, and on Feb. 17, 1933, the right knee joint was aspirated, as it appeared quite full. A cloudy yellow fluid was obtained.

The general condition remained poor, the patient being cyanotic, stuporous and toxic, with slight interludes of apparent improvement. She developed a cellulitis of the left forearm, and a bedsore. On Feb. 20, 1933, she voided bloody urine, probably due to renal infarction. She was given blood transfusions again on Feb. 16, 1933, and Feb. 23, 1933, but she continued to go downhill, remaining toxic and stuporous, and on Feb. 24, 1933, she became comatose, developed pulmonary edema, and expired on that day. It should be mentioned that she received numerous clyses throughout the illness, in addition to the blood transfusions.

The blood culture was reported positive for streptococcus hemolyticus on three occasions. The pus from the neck abscess, on culture, showed streptococcus hemolyticus and staphylococcus aureus. The fluid from the knee joint showed streptococcus nonhemolyticus.

The leukocyte counts varied between 10,050 and 23,000; the polys. between 79 and 95 per cent.

The temperature on admission was 104.4°; that evening, she had a chill and the temperature reached 107.2°, then varied between 100° and 102° to 104° and 106°. After the operation, it ranged between 101° and 105°, and on Feb. 7, 1933, it reached 107.4°. It then ran between 102° and 104° until Feb. 12, 1933, when it reached 106°. Thereafter it varied between 101° and 104°. On Feb. 21, 1933, it reached 106°, and on the day of death she had a chill and a temperature of 106°.

Case 2: C. R. K., No. 175,357, age 22 years, mechanic, white, born in the United States, was admitted to the private service of Dr. F. E. Stone on Nov. 25, 1933.

The patient was quite well until seven days before admission, when he began to complain of pain in the throat and dysphagia, both being very mild in character. These two symptoms were associated with marked weakness, generalized pain throughout the body, and slight, unproductive cough. The pain in the throat and the dysphagia gradually became more severe, and about three days before admission the cough became productive, the patient bringing up a bloody, purulent sputum. Swelling of the left anterior part of the neck became noticeable about two days before admission and increased.

The temperature on admission was 104° F. He looked acutely ill and was dyspneic. The throat was slightly injected, otherwise negative. There was a tense, unlocalized swelling in the left anterior triangle of the neck and the lower half of the sternomastoid, extending forward and encroaching somewhat upon the larynx anteriorly. It also extended to the left sternoclavicular junction. The mass was very tense and tender, and there was no fluctuation. The thyroid cartilage was freely palpable, and the right side of the neck was free. There was an extreme edema of the left half of the larynx.

He was taken to the operating room by Dr. Stone on the day of admission. An incision was made along the anterior border of the left sternomastoid muscle from the level of the hyoid bone. The tissues were indurated, dead white in color, under extreme tension and dry. Muscle and fascial planes were firmly agglutinated, as though with adhesions of long standing. The carotid sheath was exposed in its entirety after retracting the sternomastoid muscle and excising the posterior belly of the omohyoid muscle. The sheath was excised in its upper half, exposing the jugular vein, which was fairly healthy at its upper third, but as the dissection was carried further down, its wall was infiltrated and covered with exudate. At the lower third of the neck, the adhesions were extremely tense and the process appeared to be more active. In view of the firm adhesions and apparent attempt to localize at the level of the superior mediastinum, further dissection of this sheath was not attempted for the present.

Two pieces of rubber dam drain were placed down to the jugular vein, and the wound left wide open except for two black silk sutures above and below. Palpation of the jugular vein had yielded no suggestion of a thrombus, fluid blood apparently being present throughout. Ligation and excision of the jugular vein were deferred for 24 hours.

The next day the patient was again taken to the operating room, Dr. Stone and Dr. Leibowitz operating. The wound was avulsed, the carotid sheath and jugular vein exposed. A phlegmonous process involved the sheath and wall of the vein, and the surrounding fascial and muscle planes.

Small nests of free pus were found in the pretracheal fascia, the process extending down about one inch below the clavicle, where adhesions attempted to limit the extension of the process. Although the jugular wall was tremendously thickened, it appeared soft and aspiration yielded free blood. The vein was cut and ligated above, and below at the level of the cut omohyoid muscle, with free bleeding above and below. The lower ligature was cut and the upper ligature was left long, out of the wound. One long iodoform gauze pad was placed to the superior mediastinum and along the carotid sheath; one superficial gauze pad was placed in the open wound. The wound was not sutured.

That evening the patient had no difficulty in breathing and he received 50 cc. of 50 per cent glucose intravenously.

X-rays of the neck on Nov. 27, 1934, were reported as follows: There is a definite broadening of the soft tissues immediately anterior to the cervical vertebrae, superiorly, indicating retropharyngeal soft tissue infiltration.

X-rays of the chest were reported as follows: No evidence of superior mediastinal tumor or other intrathoracic pathology is observed.

His condition that day was better, he was more comfortable and the larynx was better. There was no free pus in the wound, the superficial pack was removed, and the deeper pack was loosened to facilitate drainage. The ocular fundi were normal.

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On Nov. 30, 1934, the gauze packing when removed was found to be saturated with foul, green pus, the pus welling up from the superior mediastinum. The wound was dakinized, and two rubber dam drains inserted.

On Dec. 3, 1934, the temperature was down. The foul necrotic process was still going on in the depths of the wound, apparently unaffected by three days of continuous Dakinization. The wound was cleaned, sucked out, and 1:5,000 bichloride of mercury pads inserted.

By Dec. 6, 1934, the patient had no complaints, the temperature was flat, and the foul odor from the wound had disappeared. The mediastinal drainage had ceased, and the wound was granulating in nicely. Small sloughs were only present on the jugular stumps. Flushing the wound with peroxide appeared to have controlled the anerobic infection. Dakinization of the wound, which had been continuous for five days, was now discontinued.

On Dec. 7, 1934, there was still a little pus in the wound, though the patient was feeling well and the temperature had been flat for several days. By Dec. 10, 1934, there was no pus in the wound, which was granulating in rapidly, and the temperature remaining flat, the patient was discharged to Dr. Stone's office for completion of the dressings.

The blood culture taken on Nov. 25, 1934, was sterile. The leukocyte count on two occasions was 22,800 and 16,000, and the polys. 92 and 91 per cent, respectively.

The temperature on admission was 104°, the next day it was 100.2°, and it ranged between 100° and 101° until Nov. 30, 1934, when it began to run between 98° and 100° until Dec. 4, 1934, and then between 98° and 99° until discharged on Dec. 11, 1934.

The Wassermann and Kahn tests were negative.

Case 3: A. S., No. 185,891, age 10 years, Hebrew, male, born in the United States, was admitted to the private service of Dr. Philip Leibowitz on Nov. 28, 1935.

Three days before admission, the patient had a rhinopharyngitis. The following morning he had diarrhea, and he complained also of a tickling in the throat. That afternoon, while playing he fell and hurt his left chest and neck. A swelling developed in his neck, which gradually increased and became tender. The day before admission, the temperature rose to 104° and he complained of left-sided sore throat. On the morning of Nov. 28, 1935, the patient had a chill, the temperature rose to 106° and he became irrational. The swelling had also increased toward the face and the angle of the jaw.

The temperature on admission to the hospital was 104.6° F., pulse 128, and respirations 28. There was a follicular pharyngitis, edema of the soft palate on the left side, trismus and some difficulty in protruding the tongue. There was a brawny edema of the submental area and a doughy edema of the anterior triangle (left) of the neck, with tenderness of that area.

The patient was irrational and restless, and the impression was that he had a primary jugular vein thrombosis. A blood culture was taken. That evening the temperature rose to 105.8° F.

Eyeground examination the next day was negative for any pathology.

He was taken to the operating room on Nov. 29, 1935. An incision was made just anterior to the sternomastoid muscle on the left side, the carotid sheath was exposed and opened, and this was found to contain thin, yellow pus, suggestive of a streptococcus hemolyticus infection. The

internal jugular vein was exposed as low down as the clavicle and up towards the angle of the jaw. The upper part of the vein was somewhat gray and thin. There was no thrombus present, the vein being quite full. The submaxillary fascial space was opened and found to contain the same type of purulent material. Apparently this was the primary site of the infection in the neck which extended to the carotid sheath. The jugular vein was ligated above and below and resected between. Its facial branch was also ligated. Three iodoform gauze drains were inserted into the neck, two of which were directed up into the submaxillary space and one down towards the clavicle. The wound was left wide open and moist dressings were applied.

Eyeground examination the next day was again negative. By Dec. 2, 1935, the mentality and sensorium were clear. On this day a nasopharyngeal swelling was noted on the left side. This was incised in two places, but no pus was obtained.

Blood cultures taken on Nov. 28, 1935, and Dec. 2, 1935, were both sterile. Culture of the pus obtained at the operation showed streptococcus hemolyticus.

The white blood counts varied between 16,000 and 23,600, and the polys. between 80 and 87 per cent.

After the operation the temperature dropped from 105.4° to 101° F.; it then rose to 104° and remained 103° to 104° until Dec. 1, 1935. On Dec. 2, 1935, and Dec. 3, 1935, it was between 101° and 104.2° and dropped to 99° and was between 99° and 101° until Dec. 8, 1935. The temperature then varied between normal and 100° until Dec. 12, 1935, when it went up to 102.4° F., and between 99° and 102.4° for two days, and beginning Dec. 14 it was between 99° and 100° for three days, and then normal until Dec. 20, 1935, when the patient was discharged to Dr. Leibowitz's office for completion of the dressings.

Case 4: A. B., No. 204,766, age 25 years, clerk, single, born in the United States, was admitted on Aug. 26, 1937, to the medical service of the late Dr. Henry Sussman.

Two weeks before admission, the patient had headache and a sore throat. During the night he developed severe chills, shaking in character. A local doctor, called the following morning, found the temperature to be 105° and he gave the patient two antidiphtheritic injections. These had no effect, and another local doctor was called, who advised frequent throat irrigations and general nursing care. The temperature dropped to 102° in a few days. He was allowed to walk around the house, and several days later large glands began to develop posteriorly on the left side of the neck, associated with a rise in temperature to 105°.

He was admitted to the hospital with a temperature of 105.6°. The patient appeared acutely ill; he could open his mouth and speak without difficulty. The pharynx was markedly injected, both tonsils were edematous, hypertrophied and swollen; the left tonsil was larger than the right and was covered with a milky white, thin, nonadherent membrane. The left submaxillary cervical glands were markedly enlarged and matted together, no fluctuation being present. The skin over the glands was freely movable.

He was put on hydrotherapy, ice bag to throat, throat irrigations, gargle and acetylsalicylic acid.

By Aug. 29, 1937, temperature had assumed a definitely septic course and a septic thrombophlebitis of the tonsillar and deep cervical veins was considered. The next day he was seen by a nose and throat consultant, who found tenderness along the large vessels of the neck on the left side and, therefore, considered the possibility of a jugular throm-

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bosis. He advised: 1. a Tobey-Ayer test; 2. continual blood cultures; 3. transfusions; and 4. daily blood studies.

The Tobey-Ayer test performed on the same day was negative.

On Aug. 31, 1937, Dr. E. L. Berger also found tenderness along the left internal jugular vein and he advised that if the blood culture was reported positive, he would be in favor of ligating the vein.

All this time the temperature was intermittent, between 100° and 106°. That same day the patient had another chill, and the blood culture was reported as having streptococcus viridans.

The patient was transferred to the ear, nose and throat service on Sept. 1, 1937. He was given a transfusion of 300 cc. of whole blood, and on Sept. 2, 1937, he was taken to the operating room.

An incision was made along the anterior margin of the left sternomastoid muscle. When the carotid sheath was freed of surrounding tissue and glands and opened, free pus was obtained, creamy white in character, and it welled up under pressure.

Further blunt dissection isolated the internal jugular vein, which was found to have a white, thickened, gangrenous wall. The vein was perforated in several places and its lumen was full of the same creamy white pus. It was dissected free up to the angle of the jaw and down almost to the clavicle, where the above condition extended. It was ligated with heavy chromic catgut, above and below the limits of its dissected area, and the portion of the vein between the ligatures was resected. Penrose drains were inserted deep in the tract, one at the upper extremity and one below, the wound was packed with iodoform gauze and left open except for two silk retention sutures. A dry dressing was applied.

The next day, a blood transfusion of 250 cc. was given. The temperature continued febrile; eye consultation showed the fundi to be negative. On Sept. 8, 1937, there was noted a diffuse swelling, somewhat tender, under the upper end of the sternomastoid, although the original submaxillary swelling had markedly subsided. There was definite edema over the mastoid and the impression was that the pathology was ascending, with the probability of the jugular bulb being thrombotic, if not the lateral sinus, per se. X-rays of the mastoids on Sept. 9, 1937, revealed a generalized haze on the left side.

By Sept. 11, 1937, the edema over the mastoid had greatly extended and the mastoid was tender. He had received a blood transfusion of 350 cc. on Sept. 8, 1937, and an eye consultation on Sept. 8, 1937, had revealed no pathology. A medical consultation on Sept. 11, 1937, revealed no other cause for the continued fever except the local condition, and it was decided to expose the lateral sinus and jugular bulb by a mastoid approach.

The mastoid was well pneumatized. There was congestion of the cell mucosa, but no suppuration or necrosis except at the tip, where the mastoid was found perforated into the digastric groove and under the digastric muscle. The mastoid cells were exenterated. The lateral sinus plate appeared normal; it was removed and the lateral sinus exposed from the upper end to well down towards the jugular bulb. The surface of the sinus was slightly discolored and somewhat mottled. Aspiration drew no blood. Plugs were put in above and below, and the sinus incised. It was found, particularly near the jugular bulb, to be markedly thickened, and it contained an adherent thrombus. This was removed and the bulb gently curetted. The plugs were removed, and no bleeding was obtained from below. There was free bleeding from above, hence three iodoform plugs were put in above, and the entire cavity below and the digastric area were packed with iodoform gauze.

Posteriorly to the upper end of the sternomastoid, an incision about an inch long was made, and a counter-incision was made down near the clavicle. These two were connected under the skin by blunt dissection. No pus was obtained. This wound, in a superior direction, was made to connect under the skin with the digastric fossa. In the superior incision, two iodoform packs were inserted, one superiorly and one running inferiorly. In the inferior incision, one iodoform drain was inserted, and in the original jugular incision, iodoform packing was again inserted and two black silk stay sutures were taken.

The patient improved, became cheerful, and the temperature receded. He received a blood transfusion of 350 cc. on Sept. 16, 1937. Eye consultation on Sept. 18, 1937, showed no changes.

The temperature reached 100° by Sept. 15, 1937; it ranged between 100° and 102° until Sept. 23, 1937, and then between 99° and 100° until Sept. 28, 1937; it reached 99° by Sept. 29, 1937, and it was between normal and 99° until his discharge on Oct. 6, 1937.

Blood cultures were reported positive for streptococcus viridans on Aug. 29, 1937, and Aug. 31, 1937. They were reported sterile on Aug. 30, 1937; Sept. 1, 1937; Sept. 9, 1937, and Sept. 16, 1937. Culture for the pus from the carotid sheath abscess was reported as streptococcus hemolyticus. Throat culture was reported as streptococcus nonhemolyticus.

The leukocyte count varied between 21,000 and 33,600, and the polys. between 66 and 84 per cent.

The patient was put on sulfanilamide when he came in and it was discontinued on Aug. 31, 1937, because of cyanosis and because of no influence on the course of the illness.

Case 5: A. A., No. 209,780, age 28 years, male, colored, married, porter, born in the United States, was admitted on Feb. 9, 1938, to the service of Dr. Phillip Leibowitz. He gave a history of having had a running nose and sore throat four weeks previously. This subsided in a week, and about 11 days before admission he again developed a slight sore throat and felt a small nodule under and just anterior to the angle of the jaw on the right side. This became progressively large and had from the outset been firm, painful and tender. The patient thought he had fever for the week before admission, though he hadn't used a thermometer; however, he did have chilly sensations, lasting several minutes, for several days before admission, and these episodes were followed by profuse sweats.

On admission the temperature was 103° F., pulse 100, respirations 22; he appeared acutely ill and had obvious pain on attempts to move his neck. There was a large homogeneous swelling in the region of the right maxillary area and angle of the mandible. This swelling extended from about one and one-half inches from the chin well back to the posterior margin of the sternomastoid muscle, and from the midpoint of the neck up to an edematous area over the mastoid process. The swelling was exquisitely tender, hot, very firm, with a questionable fluctuating sensation throughout, but a relatively softer area at its summit. There was some trismus present, the pharynx and tonsillar pillars were markedly reddened, and there was no evidence of any retro- or peritonsillar swelling. The nose was essentially negative, and the ear canals and membrana tympani were also negative.

A blood culture, and a throat culture and smear were taken. Hot compresses were applied to the neck and he was put on sulfanilamide. The leukocyte count on admission was 23,200, with 93 per cent polymorphonuclears.

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The following day, under local anesthesia, an incision and drainage (by S. W.) of the submaxillary abscess was performed. The incision extended from midway between the tip of the mastoid and the angle of the jaw, about one inch below the latter, and ran parallel to the ramus of the mandible in the fold of the skin, the incision being about five inches long. There was a gush of about six ounces of greenish, foul-smelling pus. The cavity contained about five pockets, running in various directions; the adhesions were all broken and one large cavity made. Iodoform gauze packing was used.

The blood culture was sterile. The culture and smear from the tonsils and pharynx showed some colonies of streptococcus hemolyticus.

The pus obtained from the abscess, on smear, showed tiny cocci and Gram positive bacilli. There was no growth on culture.

The patient progressed favorably, his temperature dropped, and on Feb. 21, 1938, he was discharged to the out-patient department for dressings. Everything was proceeding favorably until the evening of Feb. 28, 1938, when he became aware of pain in his previous operated area, and the region around the angle of the jaw became tender. He was seized by a shaking chill. He was admitted to the hospital again the following day, March 1, 1938, with a temperature of 103.2° F. For several hours before admission there had been pain on swallowing.

On this second admission there was still drainage from the incision under the mandible, and there was induration of the posterior end of the wound and beneath the angle of the jaw. An edema, superimposed upon this, spread up to and involved the mastoid area which was tender. The right side of the neck, along the course of the great vessels, on palpation was slightly firmer than on the left, and was exquisitely tender from the mastoid tip down to the clavicle. The pharynx had a congested mucosa with moderately enlarged tonsils, neither of which was displaced. The ear canals and membrana tympani were negative, and the eyes (fundi) were negative.

He was operated on March 2, 1938 (by P. L., assisted by S. W.). An incision was made along the anterior border of the sternomastoid muscle extending from the previous horizontal incision to the clavicle. The internal jugular vein was exposed and the entire upper half was found to be discolored, but not thrombosed. It was ligated above the facial vein and two pieces of iodoform gauze drain were inserted, one high up and one lower down; the muscles were brought together over the drains by means of three plain catgut sutures. The skin was not sutured and a dry dressing was applied.

The condition progressed favorably except for a pus pocket in the upper end of the wound, which gave him some pain.

The fundi (eyes), examined on several occasions, were negative. The temperature reached normal by March 8, 1938, but on March 24, 1938, he had a rise to 103° F., for which no cause could be found except the local condition. The temperature subsided again by March 26, 1938, and he was discharged to the out-patient department on April 2, 1938. During the stay in the hospital he was on sulfanilamide until March 30, 1938. Blood cultures taken on three occasions were all negative.

The wound was entirely healed on May 13, 1938. The patient was tonsillectomized on Oct. 26, 1938.

Case 6: G. M., No. 210,338, age 51 years, male, married, printer, Hebrew, born in Russia, was admitted to the private service of Dr. E. L. Berger on March 22, 1938.

The patient was perfectly well until one week before admission, at which time he had a sore throat, with a temperature of 102° F. Two days later he noticed a swelling on the right side of the neck under the angle of the jaw, which was very tender.

Since then his temperature ranged between 103.5° and 105°. There had been no chills, vomiting or headache, although for two days he had a dry, nonproductive cough. The swelling under the jaw had gotten progressively larger, and at noon on the day of admission the patient had a chill.

The temperature on admission was 105.4° F., pulse 120, respirations 22. The patient appeared acutely ill, moderately cyanotic and hyperpneic. The pharynx showed a dusky congestion, especially on the right side. The tonsils were moderately enlarged and had the same dusky congestion. There was a diffuse, moderately tender and indurated swelling on the right side of the neck under the angle of the jaw. The neck along the course of the great vessels on the right side was tender, and firmer in consistence than on the left side. The ears were negative. There were patchy areas of impaired resonance, bronchovesicular breathing, and crepitant rales scattered over the right chest posteriorly, in the axilla and over the left lower chest posteriorly. Voice, whisper and fremitus showed no obvious change.

That same day he was seen by a medical consultant, who didn't think that the pneumonic status accounted for the clinical picture.

The next morning the patient's temperature was 102°, after which he had a chill, and the temperature rose to 104.3° F.

Blood culture taken the previous day showed the plates to be sterile, but the broth culture showed a streptococcus (the type of which had not yet been determined). That day the medical consultant expressed the opinion that the patient had a septic thrombophlebitis with a septic bronchopneumonia. In the evening the patient's temperature was 105°, and he was taken to the operating room.

The jugular sheath was exposed and it was found thickened and matted together with the vein in the region of the facial branch and above. This portion of the vein was resected. An iodoform gauze drain was used.

During his stay in the hospital the patient received 20 doses of 30 cc. of 2.5 per cent prontosil intramuscularly. On March 25, 1938, because of hyperpnea, cyanosis, distention and disorientation, he was put in an oxygen tent until March 30, 1938.

His temperature was septic in type, between about 100° to 105° until March 28, 1938; then on March 29, 1938, ran between 99° and 103°, and by April 2, 1938, was down to 99°, and remained normal until April 10, 1938, when he was discharged.

It should be added that the blood cultures on March 22, 1938, and on March 24, 1938, were reported as: plates sterile, streptococcus in broths; March 28, 1938, streptococcus hemolyticus, 18 colonies per plate, and on March 30, 1938, the blood culture was sterile.

The white blood cells on admission were 17,600, with 51 per cent polymorphonuclears. Thereafter, the counts varied from 7,700 to 13,800, and the polys. from 48 to 86 per cent.

SUMMARY AND CONCLUSIONS.

1. Six cases of post-tonsillitic internal jugular vein thrombophlebitis are reported. The jugular vein was either ligated

or resected in every case but one. In the latter, the internal jugular vein could not be distinguished as such. It appeared as a fibrosed, necrotic strip of tissue adherent to the carotid artery. This was the only fatality.

2. The blood cultures were positive in three out of the six cases, streptococcus hemolyticus being reported in two of the cases, and streptococcus viridans in the third.

3. In one of the cases (Case 4), there was a retrograde extension of the thrombophlebitis process to the jugular bulb and lateral sinus.

4. Thrombophlebitis of the internal jugular vein is one of the most serious sequelae of tonsillar and pharyngeal infections. Following any throat infection, light or severe, the persistence of a septic temperature should lead one to consider thrombophlebitis of the internal jugular vein.

5. Acute suppurative infections of the fascial spaces of the upper neck challenge every resource of the surgeon. A good knowledge of the anatomy of these fascial planes, the choice of the most suitable time for operation, and the employment of modern technique in the surgery of deep abscess of the neck will greatly lower the mortality of this serious malady.

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PSYCHOGENIC IMPEDIMENTS OF THE VOICE.

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A resemblance may be found between some disturbances of the voice and stuttering, regarding a logical relation of the different symptoms of these diseases. It takes the stutterer as much time to relax the glottis or the mouth cavity as a normal man would need to relax a similarly strong contraction. If there is no proportion between the strength of the closure and the time needed for its loosening, an unusual development of the stuttering may be concluded.¹ A patient maintaining a very feeble closure for a long time has probably acquired his trouble by imitation.

I have often observed a certain logical relation between the different phenomena in the so-called functional impediments of the voice. The most frequent of these functional impediments are chronic hoarseness, phonasthenia, rhesasthenia, clesasthenia and waste of breath on a functional basis. Troubles which result from the changing of voice will not be considered here.

We distinguish objective and subjective symptoms of chronic functional hoarseness and three kinds of asthenia. Abnormal tones and noises are objective symptoms. (These tones and noises often are mixed to such a degree that we cannot separate them chronologically.) I proposed the names of hyper- and hypofunctions of the vocal apparatus for the acoustical and kinesthetical impressions on the investigator. The hyperfunctions produce the impression of high strain; the hypofunction, an impression of flabbiness. My² attempt to localize the hyperfunctions in different parts of the throat and mouth cavity gave good results.

Some of the nervous symptoms of the above-mentioned asthenics are objectively perceptible, but partly they are only perceived by the patient. These symptoms may be attributed to the phobias and nervous flabbiness. Decrease of the voice-range in the high, low or middle region, and pathological change of the strength (decreased facility to sing fortissimo

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or piano) are symptoms to be observed objectively, especially if the opportunity for a longer investigation is given.

It has been considered as a nearly general characteristic of asthenic voices that there is no sufficient relation between the acoustic deviations and the results of the inspection of the larynx, as far as the anatomical aspect fails to explain the trouble of the voice. My own experiences corroborate this opinion, but an investigation of the mouth, pharynx and palate usually shows signs of a pathological strain. One can observe redness of the pharynx, the palatal arch, swelling in different places, and very often varices of the palate.

It is superfluous to describe the importance of the resonating cavities for the voice. (In the war the writer saw a man who had cut his throat to the vertebral column. The moaning of this dying man made quite a different impression than that of a man whose larynx communicates with the resonant cavities.) If the parts of the resonant cavities which are variable in their shape are not correctly used, the voice sounds different than with more perfectly formed cavities. Of course, the attitude of the observer is very significant. The ideals of beauty are manifold. Many people may not be disturbed by a hyperfunctional tone formation and may appreciate such a tone as beautiful, but the author gets the impression of a beautiful voice only when no hyperfunction takes place. This attitude is partly the result of my experiences that many singers and speakers who often produce hyperfunctional tones become phonasthenic. I believe that in the art of voice, hygiene and aesthetics are perfectly congruent and that a hygienically formed tone possesses the property of beauty.

It is surprising that Nature forms a capable unity of living by the two different genes of father and mother. For instance, many persons may have inherited the larynx of one parent and the resonant cavity of the other. Notwithstanding, nearly every person is able to speak with a pleasing voice and to sing at least agreeably after having passed a hygienic voice culture. This marvelous production of Nature is not diminished by the fact that a part of the resonant cavities can change form by muscle movements. (To educate a pupil to form these cavities at their best is one of the most significant parts of voice education.)

An improper formation damages not only the tone but also the moving muscles, the mucous linings, vessels and nerves, resulting in pain and paraesthesia. It is conceivable that such a patient is included in a vicious circle because the pain and paraesthesia induce him toward a more hyperfunctional voice production, especially hypochondric persons who will be unfavorably influenced by such sensations.

We occasionally observe hyperfunctional singers who never complained of impediment of voice. For this reason, I call such cases "chronic functional hoarseness" or, simpler, "hyperfunctional," and not "phonasthenic." *I believe that the difference between the chronic functional hoarseness, which is also apparent in children, and the phonasthenia is due to the absence or presence of self-observation and hypochondria.*

On returning to the conditions of mouth and pharynx in phonasthenia, I repeat that there exist many characteristic deviations from normalcy; therefore, I expect a correction of the common opinion about the incongruity of voice troubles and inadequacy of anatomical changes, as I corrected my former opinion. With some exaggeration one could say that chronic functional hoarseness and asthenias of voice are not so much due to the larynx as to the mobile resonant cavities. One must not forget that in such cases the respiration also is not normal; therefore, the impediments of voice here described must be explained as the result of a false function of various degrees of the different parts, and it was my intention to show the rôle which the pharynx and mouth play in some impediments of the voice.

The complaints of the patient consist chiefly of the diminution of the voice and in descriptions of pains and paraesthesias. Flatau,³ who was the first to describe most exactly the asthenias of the voice, referred to these conditions in an impressive manner.

In my opinion there exists a great congruity between impediments of the voice on one hand, and the findings in the mouth and pharynx on the other hand, and, furthermore, between these appearances and the complaints of the patient. There also seems to exist a certain, though not fixed relation between all the pathological conditions and the degree of the phonetical use. For instance, a patient with a moderate hyper-

function becomes aware of his troubles later than one who uses his voice in a similar manner more often. Even though there is no mathematical relation, this helps us to pick up a group of diseases in which exists an obvious discrepancy between a relatively small use of the voice and the complaints.

The experience about the relation of the severity of the voice trouble and the expected complaints enables us to segregate a group of diseases of the asthenias if the complaints are not caused in the relatively good voice. In such cases, one may neglect the character of occupation because a defective voice gets worse by longer use and the complaints increase; furthermore, it is probable that the complaints are not real asthenias if the patient suffers with severe difficulties and the local conditions are not very apparent.

Some histories selected from a great number may serve to illustrate very little use (use of voice, severe complaints).

Case 1: A sophomore, age 23 years, gave one private lesson a day; besides this job he had no other vocal occupation. He complained of "weariness" of the voice. His speech showed only moderate hyperfunctions, surely not sufficient to explain his complaints. He was very nervous, and we saw the cause of his troubles in his nervousness and not in the unhygienic functions of his voice. Our treatment, therefore, was a suggestive one (electric treatment on the skin of the throat for a few minutes) and not a re-education, as used in asthenias of the voice. One electric treatment removed all the complaints.

Case 2: A lawyer, age 26 years, with a sore throat and hoarseness after a short speech. His conversational voice was only moderately hyperfunctional. Loud reading at a distance of 8 metres did not impair his voice. The findings of the larynx were negative. The patient faced a very difficult board examination, which worried him. He had always been nervous. Calming psychological treatment brought him help in a few days.

Case 3: A boy, age 12 years, whose father was suffering from a chronic tuberculosis of the lungs, complained of a sore throat after a recital. Speech and voice were normal. Examination of the body negative. He recited a rather long poem without hyperfunctions. With a simple gargle and calming explanation, the boy's health returned within two weeks.

The following cases belong to the group in which there is no normal ratio between the severe complaints and the slightly defective voice:

Case 4: A woman teacher, age 43 years, related that after teaching a short time her voice became so "tired" that she could hardly continue speaking. Her voice and speech were those of an average person. The throat was normal. A further examination showed that the patient wanted to retire before the normal time. Regarding this fact, the psychotherapy fails.

Case 5: A priest, age 50 years, complained of a sore throat and pains in the chest. The acoustical and optical examination showed nothing to explain these troubles. Electric treatment removed all these difficulties.

It is conceivable that there are many transitions between the two groups. Some patients, for instance, whose occupations require but little phonation and who speak relatively well, nevertheless suffer from several of the described conditions.

I expect opposition. May a short clinical examination not reveal some symptoms which are obvious after a longer use of the voice? But a real rhesasthenic person in conversation shows hyperfunctions of a higher degree, if not even hypofunctions; also, many singers belong to these groups.

Case 6: A girl, age 24 years, pupil of a singing teacher, often became hoarse during a lesson. These lessons took place three times a week and the pupil was not allowed to practice at home. The development of the voice is a hygienic one. The patient has an elder sister singing with a much finer and thoroughly trained voice. Psychotherapy regarding the relation of the sister produces the desired result.

There is a third group of patients in which only by more thorough investigation can we avoid calling them voice asthenias. Real asthenias show a gradual progress of the symptoms during longer periods of singing and speaking. If these changes appear suddenly and not gradually, one may assume that an unusual psychical complication exists.

Very well known psychogenic voice troubles are the spastic and the paretic aphonias. We treat here only the paretic form. Laryngoscopic examinations show either an opened glottis cartilaginea, or a glottis in the position of expiration, or too short a closure, followed by a rapid opening during attempted phonation. Patients with very aspirated voices may be regarded as slighter degrees of aphonias (that is, if the cause is inorganic). There are many patients, singers and speakers, who produce such highly aspirated voices that even a false education cannot be the cause. Experience shows that such cases are explained psychologically and are influenced favorably by psychotherapy.

Summary: Some voice impediments lack the inner logical relation between different symptoms. We repeat: 1. In hyperfunction, pains and paraesthesias are more severe than usual, and do not depend on the degree of hyperfunction. 2. Weakened voice and hoarseness do not originate either in the deviation from normalcy or applied phonetic work. 3. The symptoms during a longer phonation develop faster than the degree of deviation from normalcy would indicate. These three groups, and 4. the very exaggerated expiration, seem to be

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caused by special psychical circumstances which are well differentiated from the nervous causes of the asthenias of the voice. This clinical differentiation is important for treatment.

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818 South Kingshighway.

IN MEMORIAM

HEINRICH NEUMANN, M.D.

1873-1939.

We regret to chronicle the death of Prof. Heinrich Neumann, late Director of the famous Politzer Clinic, of Vienna, and more recently of New York, where he aided the work of the American O. R. T. Federation Abroad.

Dr. Neumann was born in Hethars, Hungary, June 16, 1873, attended high school in Misholcz, became a medical student at the University of Budapest, completing his medical course in 1898 at the University of Vienna. Soon after graduation, he was named to the Staff of the Politzer Ear Clinic, in which he developed as perhaps the outstanding otologist of his time.

In 1910 at the suggestion of the writer, Neumann made an extended visit to the U. S. A. and postgraduate lecture courses were arranged for him in the metropolitan otological centres of America, from San Francisco to New York.

In 1908, at the International Otological Congress in Budapest, he shared the Lenval Prize award for outstanding otological work with Dr. A. A. Gray, of Glasgow.

In 1918, he was appointed to the medical faculty of the University of Vienna, and soon thereafter was made Chief of the famous combined Politzer-Gruber Ear Clinics.

He continued in his position as Chief of the Vienna Ear Clinic at the Allgemeines Krankenhaus until the crisis which ended with the deposition of Premier Schuschnigg. For his support of the Schuschnigg plebiscite he was placed in confinement and stripped of his professional and civil liberties, the result of which undermined his entire physical and nervous constitution. His was a dynamic personality; he was a skillful surgeon and with his scientific background, brilliant speech facilities, with ready wit and repartee, and his fearless and authoritative scientific position, he was always looked

upon in every otological convention as a forceful advocate of modern otology. He was recognized as an otological teacher of unusual ability and attainments, and his clinics, during his active professional life in Vienna, were the mecca of postgraduate students from all parts of the world.

His contributions to otologic literature were numerous and valuable, especially concerning his work on the physiology and surgery of the labyrinth, local anesthesia for mastoid operation, and his differential diagnoses of pyemic otological invasion of the brain.

For his intimates, for the large group of postgraduate students everywhere and for the glory of modern otology we offer this tribute to his memory.

M. A. G.

ROBERT SONNENSCHN, M.D.

1879-1939.

We lament the death of our dear colleague in otolaryngology, Dr. Robert Sonnenschein, of Chicago, who passed away Nov. 8, 1939, from a typhoid infection and pneumonia.

Dr. Sonnenschein was born in Chicago, July 10, 1879; received his medical degree at Rush Medical College in 1901, followed by postgraduate work in the universities of Vienna, Berlin and Koenigsberg. He was married to Miss Flore Keiferstein April 5, 1917, and of this union there are three children.

His professional record includes: Associate Clinical Professor of Laryngology and Otology at his alma mater since 1933; formerly Professor of Diseases of the Ear, Nose and Throat at the Post-Graduate Medical School; Fellow of the American Academy of Ophthalmology and Oto-Laryngology, the American Laryngological Association, American Laryngological, Rhinological and Otological Society, the American Otological Society, the American College of Surgeons; Past President of the Chicago Laryngological and Otological Society; member of the Advisory Board of the Third District of Illinois during the World War.

His otological work especially concerned Functional Tests of Hearing, and his contributions to several textbooks on special surgery were largely of this nature; he also contributed numerous papers to otological literature.

Not only do we esteem him for his honest scientific convictions and their earnest support but also for his fine qualities as a man, humanitarian and friend.

He always radiated good will, good cheer and good fellowship and was one of the most popular members of our otologic groups.

We recall his hobby of collecting old prints of distinguished scientists, and also books on otolaryngology and associated sciences.

For his many friends and for ourselves we offer our deep sympathy to his bereaved family.

M. A. G.

MAX HALLE, M.D.

1873-1939.

Dr. Max Halle was born in Berlin in 1873. He received his medical education at the Friedrich-Wilhelms University of Berlin, and was named Dozent in the Medical Faculty in 1898, where he was an active clinician and teacher of postgraduates in laryngology until his emigration to the U. S. A. in 1937.

Since coming to this country he was active in laryngological practice in New York, was a member of the Medical Society of the State of New York and of the American Academy of Ophthalmology and Oto-Laryngology. He was on the Staff of the Broad Street Hospital and the New York Polyclinic Medical School and Hospital.

Dr. Halle was killed in an automobile accident, Sept. 5, near Newcastle, Del.

For many years his polyclinic was the mecca for American laryngologists; he was an able teacher, presented his courses in good English; was a skillful surgeon and demonstrated several operations devised by him, especially Frontal Sinus Drainage Through the Nasal Pharyngeal Duct by a series of guarded electric drills; also a radical operation on deflections and deformities of the nasal septum, in which he advocated free excision of the entire deformed part of the septum.

His contributions to laryngological literature appeared mainly in the *Archiv. fur Laryngologie* and in THE LARYNGOSCOPE.

He was a genial man, a good conversationalist, and had a fine fundamental knowledge of his medical specialty.

M. A. G.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLARYNGOLOGY.

Meeting of May 3, 1939.

(Continued from November issue.)

Otitic Hydrocephalus. Dr. Harry Rosenwasser.

(To be published in a subsequent issue of THE LARYNGSCOPE.)

DISCUSSION.

DR. JACOB L. MAYBAUM: One ought to read in full the history of this case which has been presented by Dr. Rosenwasser. It would probably take a few hours, but it illustrates very forcibly the clinical picture of a condition which has only been recognized within the last eight or 10 years, and which was first described by Symonds. Furthermore, as one looks back before this period of 10 years ago, there were cases of a similar nature for which we had no explanation. In those days, we were loath to do a lumbar tap quite as freely as we do now during the course of an otitic sepsis. I can recall patients who had, following a sinus operation, a picture which resembled very much that of brain abscess, and in two instances that of a lesion of the cerebellum, but Dr. Friesner absolutely refused to entertain the suggestion of the neurologist that the brain be explored. He favored the watchful waiting course, in the hope that if no localizing signs appeared, the patient would get well without operation. Such was the outcome in each instance. The patient reported by Dr. Rosenwasser ran a somewhat similar course.

These patients have intermittent headaches, and in the interval days feel perfectly well. They all have papilloedema, which rarely goes on to atrophy. Lumbar puncture tells the story. Not only does it relieve them of their symptoms, but it shows a large amount of clear fluid with a normal cell count under high pressure, a picture which differentiates it from brain abscess. I have always felt that we could put this entity into two groups, one which occasionally follows an operation for sinus thrombosis, and secondly, a fairly large group for which there is no explanation. The latter follow an acute or chronic otitis, epidural abscess or brain abscess. The important thing is, in a case of this sort with large and increasing papilloedema and headache, to do a lumbar tap in order to establish the diagnosis, and also use this procedure as a therapeutic measure. The prognosis is usually good.

Lateral Sinus Thrombosis—An Unusual Course. Dr. Louis Hubert.

(To be published in a subsequent issue of THE LARYNGSCOPE.)

DISCUSSION.

DR. FRANCIS W. WHITE: I stood beside Dr. Hubert all through those hectic days until the time came for me to go on vacation. Upon my return, I was glad to find the patient alive. When I saw her here this evening I did not recognize her, she looks so well. She has her hearing. I thought at first Dr. Hubert had trained her a little bit—subconsciously, of course—by accustoming her to the sound of his voice, but she heard my voice perfectly at various distances and intensities.

(To be continued in a succeeding issue.)

BOOK REVIEWS.

Otolaryngology in General Practice. By Lyman G. Richards, M.D., Fellow in Otolaryngology, Courses for Graduates, and Assistant in Surgery, Harvard Medical School; Associate Professor of Otolaryngology, Tufts Medical School. Cloth. 8 vo. of 352 pages with 72 illustrations. New York. The Macmillan Co., 1939.

It has been said, and perhaps with reason, that there are too many textbooks on otolaryngology extant in America. Even though this may be true, this particular book does not add to the plethora of ear, nose and throat literature.

Recognizing the fact that a relatively large part of the daily practice of the average physician deals with affections of the upper respiratory tract, Dr. Richards has written an authoritative guide to the diagnosis and treatment of such conditions, which cannot fail to find a welcome place on the desk of the general practitioner. It will help him in selecting those cases which because of their more serious potentialities should be referred to a specialist, and will at the same time suggest the most modern methods of handling those more common conditions that can well be treated in his own office.

This little book is enthusiastically recommended to the type of physician who is on the alert to do such ear, nose and throat work as it is proper for him to do as well as it can be done.

This is just the sort of book that one might expect from the pen of the able son of a distinguished otolaryngologist.

A. M. A.

Diagnosis and Treatment of Diseases of the Esophagus. By Porter P. Vinson, Professor of Bronchoscopy, Esophagoscopy and Gastroscopy, Medical College of Virginia, Richmond, Va. Two hundred twenty-four pages with Index. Published by Charles C. Thomas, Springfield, Ill., and Baltimore, Md. 1940.

This monograph on the diseases of the esophagus is of great value to the internist, the gastroenterologist and also the esophagologist. It contains over 200 pages of information that may be used as a guide by all who are interested and treat diseases common to the esophagus.

Every chapter is a gem but those on the General Movement of the Patient, Hysterical Dysphagia — "Plummer-Vinson Syndrome" and Cardiospasm are outstanding.

Dr. Vinson's experience and training make him well qualified to produce such a well written book, and his tribute to his former chief and teacher is most gracious.

C. J. I.

